MARINE REVIEW

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SHIP BUILDING INDUSTRY OF THE UNITED STATES.

Reports to the Marine Review from ship builders in all parts of the country show an aggregate of 262 vessels, valued at $62,110,092, building or under contract on Jan. 1, 1899. Merchant vessels number 204 of 254,216 tons, valued at $19,760,900, and war vessels 58 of 146,499 tons displacement and 372,150 horse power, the contract price of which, exclusive of armor and armament, is $42,349,192. Small, unrigged vessels, pleasure crafts, etc., are not considered in this summary.

The list of naval vessels includes a battleship and cruiser building for Russia, as well as the two cruisers which are nearing completion for Japan; all other vessels of war are for the United States. There are 9 battleships, 3 cruisers, 17 torpedo boat destroyers, 21 torpedo boats, 4 monitors, 1 submarine boat, 1 training ship and 2 tugs.

Of the merchant ships, 155, valued at $15,984,900 and of 172,040 tons, are building on the sea coasts; 26, valued at $2,974,000 and of 71,400 tons, are building on the lakes; and 23, of 10,776 tons, valued at $802,000, are building on western rivers. Following are the tabulated summaries:

SHIPS BUILDING OR UNDER CONTRACT IN THE UNITED STATES, JANUARY, 1899.

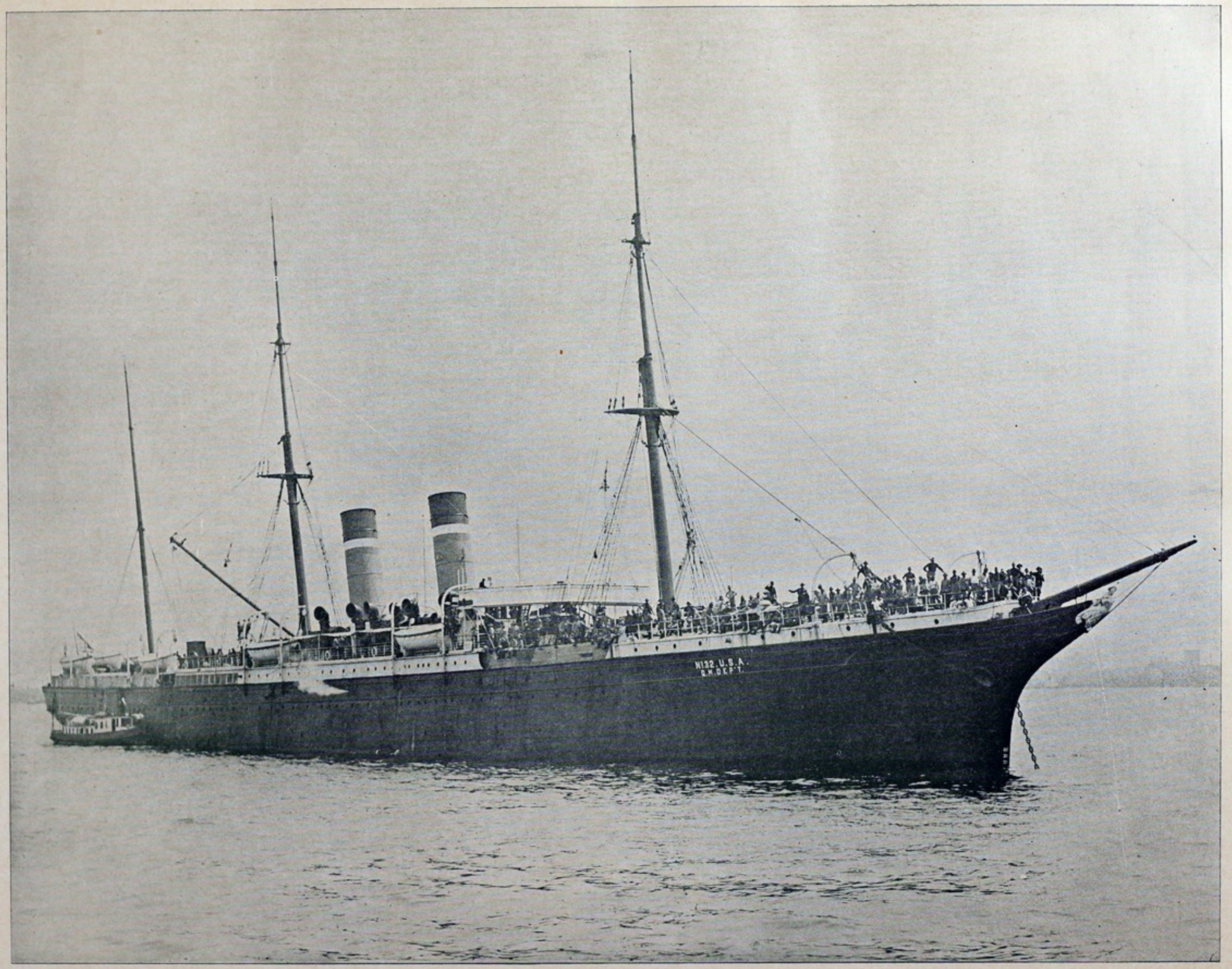
	Number of vessels.	Tonnage.	Approximate value.
ON THE SEA COAST	155	172,040	$15,984,900
ON THE GREAT LAKES	26	71,400	2,974,000
ON WESTERN RIVERS	23	10,776	802,000
	204	254,216	$19,760,900

Add to the above table of merchant vessels fifty-eight vessels of war, the aggregate contract price of which, exclusive of armor and armament, is $42,349,192; displacement 146,499 tons; and horse power, 372,150.

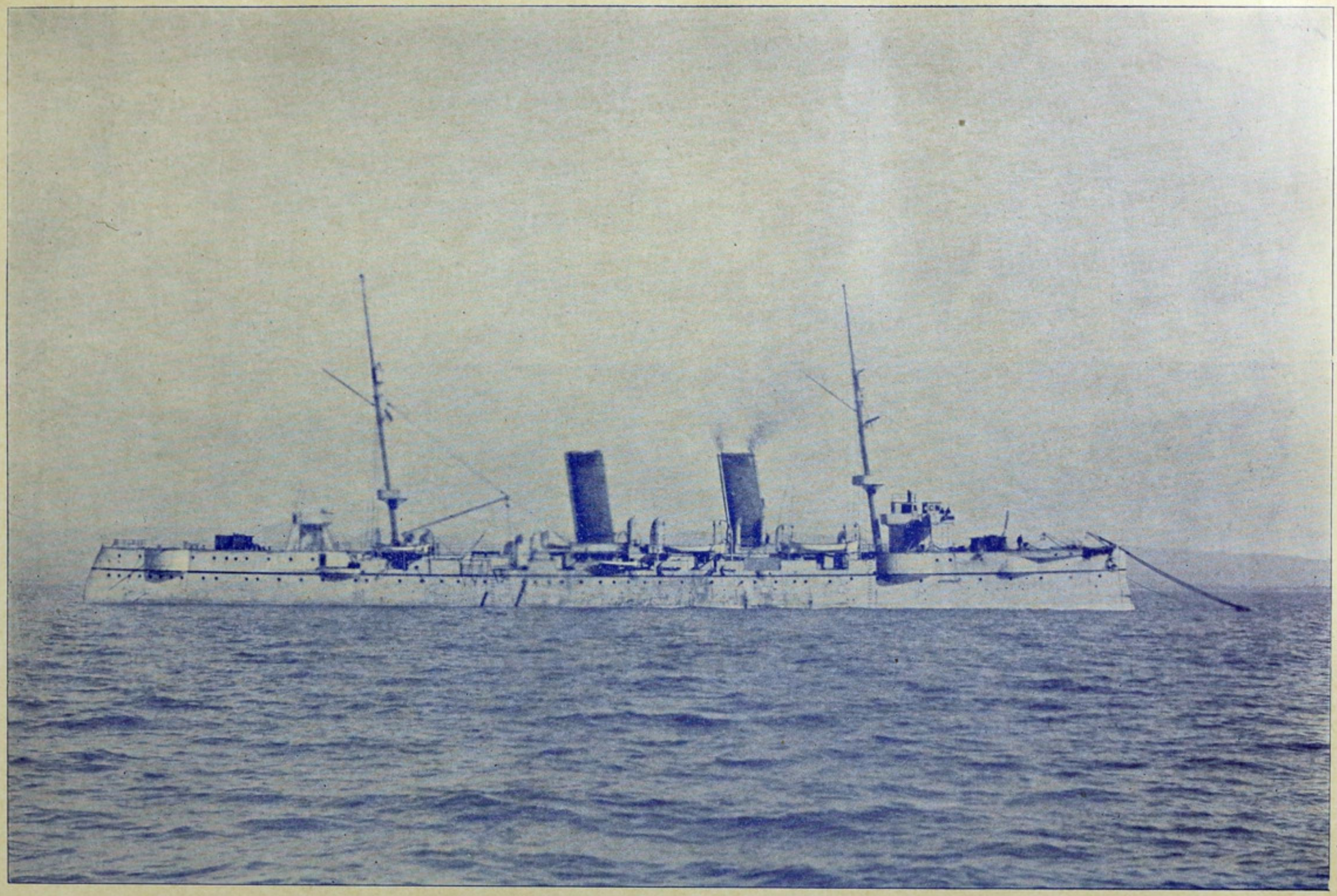
NAVAL VESSELS BUILDING OR UNDER CONTRACT IN SHIP YARDS OF THE UNITED STATES

BUILDERS.	NAME AND TYPE OF VESSEL.	DIMENSIONS. Length L. W. L.	Beam.	Mean Draught.	DISPLACEMENT.	CONTRACT PRICE.	TYPE OF ENGINE.	I. H. P.	CONTRACT SPEED IN KNOTS.
Wm. Cramp & Sons Co., Philadelphia, Pa	Battleship Alabama.	368	72	23	11,525	$2,650,000	Twin screw ver. trip. expan.	10,000	16
" " " "	Battleship Maine.	388	72	24	12,500	2,885,000	Twin screw ver. trip. expan.	16,000	18
" " " "	†Battleship	376	72	26	12,700	.....	Triple expan.	16,000	18
" " " "	†Cruiser.	400	52	19	6,500	.....	Triple expan.	20,000	23
	*Cruiser Kasagi.	375	49	18	4,000	.....	Four cylinder trip. expan.	17,000	21
Newport News S. B. & D. D. Co., Newport News, Va	Battleship Kearsarge.	368	72	23	11,525	2,250,000	Twin screw ver. trip. expan.	10,000	16
" " " " " " "	Battleship Kentucky.	368	72	23	11,525	2,250,000	Twin screw ver. trip. expan.	10,000	16
" " " " " " "	Battleship Illinois.	368	72	23	11,525	2,595,000	Twin screw ver. trip. expan.	10,000	16
" " " " " " "	Battleship Missouri.	388	72	24	12,500	2,885,000	Twin screw ver. trip. expan.	16,000	18
	Single turreted monitor Arkansas.	252	50	12	2,755	960,000	Twin screw ver. trip. expan.	2,400	11½
Union Iron Works, San Francisco, Cal	Battleship Wisconsin.	368	72	23	11,525	2,674,950	Twin screw ver. trip. expan.	10,000	16
" " " " " "	Battleship Ohio.	388	72	24	12,500	2,899,000	Twin screw ver. trip. expan.	16,000	18
" " " " " "	*Cruiser Chitose.	376	49	18	4,760	1,500,000	Four cylinder trip. expan.	15,500	22½
" " " " " "	Single turreted monitor Wyoming.	252	50	13	2,755	975,000	Trip. expan.	2,400	11½
" " " " " "	Torpedo boat Farragut.	213	21	6	273	227,500	Twin screw ver. trip. expan.	5,600	30
" " " " " "	Torpedo boat destroyer Paul Jones.	245	24	7	420	285,000	Trip. expan.	7,000	29
" " " " " "	Torpedo boat destroyer Perry.	245	24	7	420	285,000	Trip. expan.	7,000	29
" " " " " "	Torpedo boat destroyer Preble.	245	24	7	420	285,000	Trip. expan.	7,000	29
Bath Iron Works, Bath, Me	Single turreted monitor Connecticut.	252	50	12	2,755	962,000	Twin screw trip. expan.	2,400	11½
" " " " "	Training ship Chesapeake.	175	37	16	1,175	112,600	None (sailing vessel).	none	.....
" " " " "	Torpedo boat Dahlgreen.	147	16	5	146	194,000	Twin screw ver, trip. expan.	4,200	30.5
" " " " "	Torpedo boat T. A. M. Craven.	147	16	5	146	194,000	Twin screw ver. trip. expan.	4,200	30.5
" " " " "	Torpedo boat Bagley.	157	17	5	167	161,000	Twin screw ver. quad. expan.	.....	28
" " " " "	Torpedo boat Barney.	157	17	5	167	161,000	Twin screw ver. quad. expan.	.....	28
" " " " "	Torpedo boat Biddle	157	17	5	167	161,000	Twin screw ver. quad. expan.	.....	28
Wm. R. Trigg Co., Richmond, Va	Torpedo boat destroyer Dale.	245	24	7	420	260,000	Twin screw ver. inver. trip. expan.	8,000	28
" " " " "	Torpedo boat destroyer Decatur.	245	24	7	420	260,000	Twin screw ver. inver. trip. expan.	8,000	28
" " " " "	Torpedo boat Shubrick.	175	18	5	165	129,750	Twin screw ver. quad. expan.	3,000	26
" " " " "	Torpedo boat Stockton.	175	18	5	165	129,750	Twin screw ver. quad. expan.	3,000	26
	Torpedo boat Thornton.	175	18	5	165	129,750	Twin screw ver. quad. expan.	3,000	26
Lewis Nixon (Crescent Ship Yard), Elizabethport, N. J.	Single turreted monitor Florida.	252	50	13	2,755	925,000	.....	2,400	11½
" " " " " "	Torpedo boat Nicholson.	175	17	5	174	165,000	Twin screw ver. quad. expan.	.....	26
" " " " " "	Torpedo boat O'Brien.	175	17	5	174	165,000	Twin screw ver. quad. expan.	.....	26
Maryland Steel Co., Sparrow's Point, Md	Torpedo boat destroyer Truxtun.	248	23	6	433	286,000	.....	8,300	30
" " " " " "	Torpedo boat destroyer Whipple.	248	23	6	433	286,000	.....	8,300	30
	Torpedo boat destroyer Worden.	248	23	6	433	286,000	.....	8,300	30
Neafie & Levy Co., Philadelphia, Pa	Torpedo boat destroyer Bainbridge.	245	24	7	420	283,000	Twin screw ver. inver. trip. expan.	8,000	29
" " " " "	Torpedo boat destroyer Barry.	245	24	7	420	283,000	Twin screw ver. inver. trip. expan.	8,000	29
	Torpedo boat destroyer Chauncey.	245	24	7	420	283,000	Twin screw ver. inver. trip. expan.	8,000	29
Gas Engine and Power Co. & Chas. L. Seabury & Co., Consolidated, Morris Heights, N. Y	Torpedo boat destroyer Stewart.	245	24	7	420	282,000	Twin screw ver. inver. trip. expan.	8,000	29
"	Torpedo boat Bailey.	205	19	6	235	210,000	Twin screw ver. trip. expan.	5,600	30
"	Torpedo boat Wilkes.	175	18	5	165	146,000	Twin screw ver. quad. expan.	3,000	26½
Harlan & Hollingsworth Co., Wilmington, Del	Torpedo boat destroyer Hopkins.	244	25	6	408	291,000	Twin screw trip. expan.	7,200	29
" " " " "	Torpedo boat destroyer Hull.	244	25	6	408	291,000	Twin screw trip. expan.	7,200	29
	Torpedo boat Stringham.	225	22	7	340	236,000	Twin screw ver. trip. expan.	7,200	30
Fore River Engine Works, Weymouth, Mass	Torpedo boat destroyer Lawrence	243	22	6	400	281,000	Inver. four cylinder trip. expan.	8,400	30
	Torpedo boat destroyer Macdonough.	243	22	6	400	281,000	Inver. four cylinder trip. expan.	8,400	30
George Lawley & Sons Corporation, So. Boston, Mass.	Torpedo boat Blakely.	175	18	5	165	159,400	Twin screw ver. quad. expan.	3,000	26
" " " " "	Torpedo boat De Long.	175	18	5	165	159,400	Twin screw ver. quad. expan.	3,000	26
Columbian Iron Works, Baltimore, Md	Torpedo boat Tingey.	175	18	5	165	168,000	Twin screw ver. quad. expan.	3,000	26
	Submarine torpedo boat Plunger.	85	12	.....	168	160,000	Twin screw ver. trip. expan.	1,200	8
Wolf & Zwicker, Portland, Ore	Torpedo boat Davis.	146	15	5	132	81,546	Twin screw ver. trip. expan.	1,750	22.5
" " " "	Torpedo boat Fox.	146	15	5	136	81,546	Twin screw ver. trip. expan.	1,750	22.5
	Torpedo boat Goldsborough.	195	20	5	247	214,500	Twin screw ver. trip. expan.	.....	30
Moran Bros. Co., Seattle, Wash	Torpedo boat Rowan.	170	17	6	182	160,000	Twin screw ver. quad. expan.	3,200	26
Chas. Hillman Ship Building Co., Philadelphia, Pa	Torpedo boat Mackenzie.	99	13	4	65	48,500	Single screw ver. trip. expan.	850	20
U. S. Navy Yard, N. Y	Steel tug Penacook.	93	21	9	225	50,000	.....	450	.....
U. S. Navy Yard, Mare Island, Cal	Steel Tug Pawtucket.	93	21	9	225	50,000	.....	450	.....

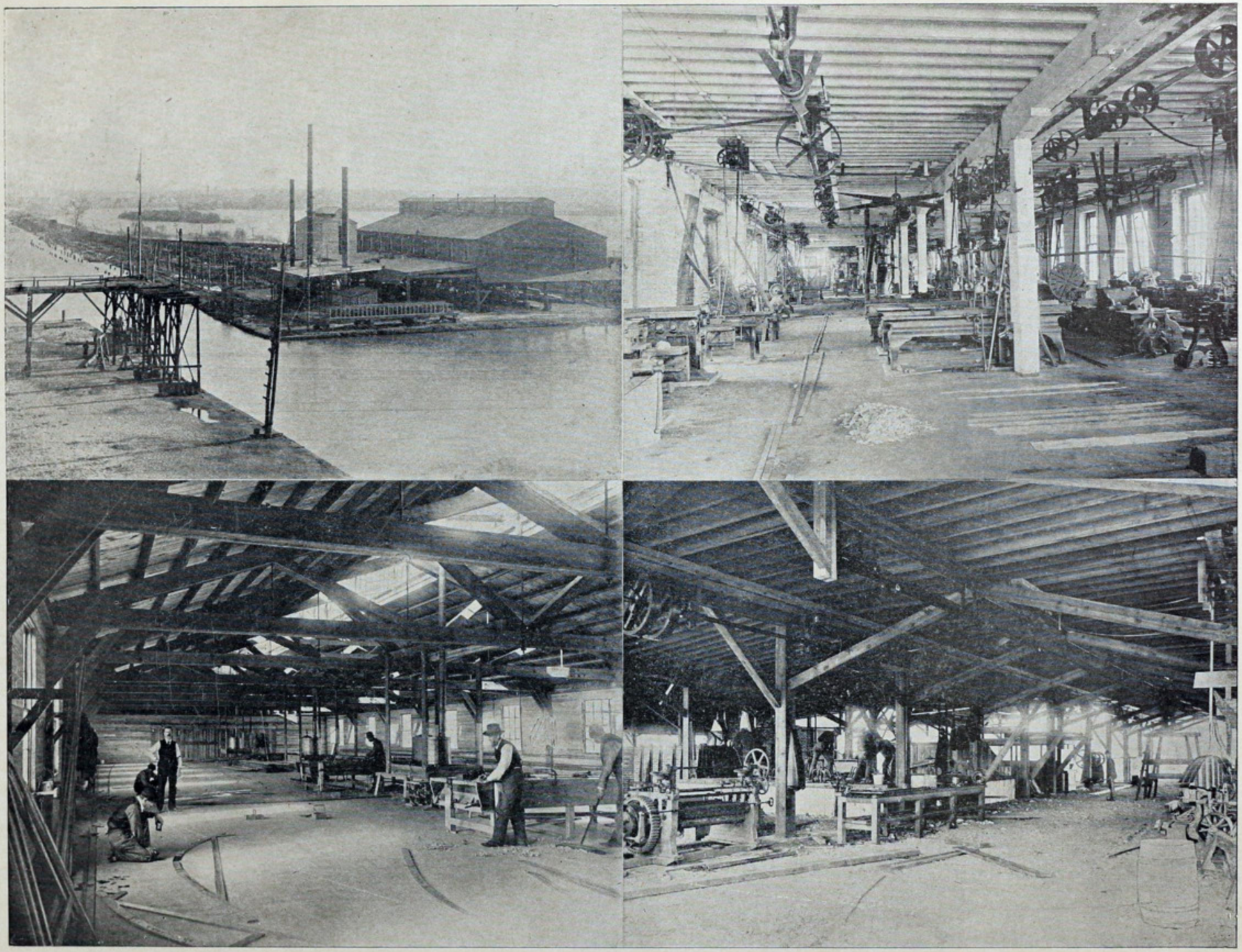
*For Japanese government; Kasagi has left Cramp yard but not yet delivered. † For Russian government.



U. S. S. CHESTER—ONE OF SIXTEEN VESSELS TRANSFORMED INTO REGULAR ARMY TRANSPORTS.



PROTECTED CRUISER CHITOSE, BUILDING BY UNION IRON WORKS, SAN FRANCISCO, CAL., FOR THE IMPERIAL JAPANESE NAVY.



AMERICA'S NEWEST SHIP YARD—SCENES AT THE PLANT OF THE WILLIAM R. TRIGG CO., RICHMOND, VA.

MERCHANT TONNAGE BUILDING OR UNDER CONTRACT IN SHIP YARDS OF THE ATLANTIC AND PACIFIC COASTS OF AMERICA—JANUARY, 1899.

BUILDERS.	NAME AND TYPE OF VESSEL.	DIMENSIONS. KEEL	BE'M	DPTH	APPROXIMATE VALUE.	TONNAGE.	ENGINES. DIMENSIONS OF CYLINDERS AND STROKE.	BOILERS—NUMBER, DIMENSIONS AND PRESSURE.	BUILDING FOR
Wm. Cramp & Sons, Philadelphia	Stmr. Havana.	360	50	32		5,000	Triple, 5,000 I. H. P.	Scotch, 160 lbs.	N. Y. & Cuba Mail Steamship Co., N. Y.
" "	Stmr. Mexico.	360	50	32		5,000	Triple, 5,000 I. H. P.	Scotch, 160 lbs.	" "
" "	Stmr. Adm. Dewey	262	36	24		2,000	Triple, 2,500 I. H. P.	Two Scotch, 160 lbs.	American Mail Steamship Co., New York.
" "	Stmr. Ad. Sampson	262	36	24		2,000	Triple, 2,500 I. H. P.	Two Scotch, 160 lbs.	" "
" "	Stmr. Adm. Schley.	262	36	24		2,000	Triple, 2,500 I. H. P.	Two Scotch, 160 lbs.	" "
" "	Stmr. Ad. Farragut	262	36	24		2,000	Triple, 2,500 I. H. P.	Two Scotch, 160 lbs.	" "
Newport News S.B.Co., Newport News, Va.	Express stmr.	390	48	34		4,660	Triple, 3,800 I. H. P.	Scotch, 180 lbs.	Morgan Line, New York.
" "	Express stmr.	390	48	34		4,660	Triple, 3,800 I. H. P.	Scotch, 180 lbs.	" "
" "	Express stmr.	390	48	34		4,660	Triple, 3,800 I. H. P.	Scotch. 180 lbs.	" "
" "	Express stmr.	390	48	34		4,660	Triple, 3,800 I. H. P.	Scotch, 180 lbs.	" "
" "	Frt. and pass.stmr.	39	48	34		4,660	Triple, 3,800 I. H. P.	Scotch, 180 lbs.	Cromwell Line, New York.
" "	Frt. and pass. stmr.	390	48	34		4,660	Triple, 3,800 I. H. P.	Scotch, 180 lbs.	" "
" "	Tug.	96	22	12			Ver. comp., 450 I. H. P.	Scotch boiler.	Morgan Line, "
Roach Ship Yard, Chester, Pa.	Oil tank stmr. Atlas	254	40	23	$225,000	2,150	Triple 21, 34, 56 x 42.	Two Scotch, 14 x 12½.	Standard Oil Co., "
" "	Ferry stmr. Phila.	186	46	17	200,000	1,600	Comp. 20, 32, 32 x 24.	Four Thornycroft.	Pennsylvania Railroad Co., New York.
" "	Stmr. Hamilton.	304	42	27	375,000	3,200	Triple 28, 44, 73 x 54.	Four Scotch, 14 x 12½.	Old Dominion Line, New York.
" "	Stmr. Jefferson.	304	42	27	375,000	3,200	Triple 28, 44, 73 x 54.	Four Scotch, 14 x 12½.	" "
" "	Yacht Aileen.	122	20	12½	60,000	160	Triple 10, 16, 25 x 16.	Two Almy.	Rich. Stevens, Hoboken, New Jersey.
" "	Yacht.	140	20	12½	75,000	180	Triple 12½, 20, 22½, 22½x18	Four Almy.	Eugene Toupkins, Boston, Mass.
" "	Yacht Eugenia.	140	21	14	80,000	200	Triple 12, 19, 31 x 21.	Two Almy.	J. Gardner Cassatt Philadelphia, Pa.
" "	Yacht.	155	22	12	100,000	220	Triple 12½, 20, 22½, 22½x18	Four Almy.	H. E. Tower, Poughkeepsie, N. Y.
" "	Frt. and pass. stmr.	300	50	20	375,000		Triple of 2,500 H. P.	6 Scotch, 170.	John Englis, New York.
Union Iron Works, San Francisco..	Tug.	100	22½	14	70,000	174	Comp. 20, 42 x 24.		J. D. Spreckels Bros. Co., San Francisco.
" "	Tug Wallula,	100	22½	14	70,000	174	Comp. 20, 42 x 24.		Oregon Rail & Navigation Co.
" "	Tender Union.	70	20	8	15,000	130	Comp. 9, 17 x 12.		Union Iron Works, San Francisco.
" "	Ferryboat Berkeley	260	40	17			Triple 23, 34 and 56 x 36.	Scotch, 165 lbs.	Southern Pacific Co., San Francisco.
Harlan & Hollingsworth Co., Wilm'ton, Del.	Tug Valley Forge.	158	29	18		558	Triple 18, 28, 45 x 30.	2 Scotch, 12x12½, 165 lbs.	
" "	Stmr. Tennessee.	245	43	38		1,240	Triple 18, 28, 45 x 30.	3 Scotch, 11x11½, 160 lbs.	
" "	Stmr. S. T. Morgan	261	41	22		1,836	Triple 20, 33, 50 x 36.	2 Scotch, 12x11½, 165 lbs.	
" "	Tug Gettysburg.	158	29	18		558	Triple 18, 28, 45 x 30.	2 Scotch, 12x12½, 165 lbs.	
" "	Tug Gem.	67	18	8		62	Comp. 13, 28 x 18.	1 Scotch, 9x10½, 125 lbs.	
" "	S. S. Kershaw.	274	42	34			Triple 28, 45, 72 x 54.	4 Scotch, 14½x12. 170 lbs.	Merchants' & Miners' Tr. Co., Balti., Md.
" "	S. S. Nantucket.	274	42	34			Triple 28, 45, 72 x 54.	4 Scotch, 14½x12, 170 lbs.	" "
" "	S. S. Ponce,	317	42	28			Triple 24, 38, 62 x 42.	2 Scotch, 14½x11, 180 lbs.	Miller, Bull & Knowlton, New York.
" "	S. S. San Juan.	317	42	28			Triple 24, 38, 62 x 42.	2 Scotch, 14½x11, 180 lbs.	" "
" "	S. S. frt. and pass.	277½	37	18½	210,000	1,500	Triple 14, 22, 36 x 24.	Scotch.	Boulton, Bliss & Dallet (Red D Line), N.Y.
Columbian Iron Work Co., Baltimore, Md.	Revenue Cut. No. 6	170	29½	16½	225,000		Triple 20, 32, 50 x 27.	2 Scotch, 13x16, 160 lbs.	U. S. Rev. Cutter Serv., Washington, D. C.
" "	Tug Piedmont.	145	27	16	95,000		Triple 16, 24, 41 x 30.	2 Scotch, 10½x12, 160 lbs.	Consolidation Coal Co., Baltimore, Md.
W. & A. Fletcher Co., Hoboken, N. J.	*Str. Yacht Corsair	252	33	22			Triple.	Double ended Scotch.	J. Pierpont Morgan, New York
" "	*Pas. str. W'nShore	180	29	11	80,000	700	Beam 42 x 7.	One return tubular.	Old Dominion Steamship Co., New York.
" "	*Ferry Brinkerhoff	120	28	11	55,000	400	Beam 36 x 7.	One return flue.	J. H. Brinkerhoff, Poughkeepsie, N. Y.
Burlee Dry Dock Co., Staten Island, N. Y.	Steel tug.	165	29½	19	105,000	600		Two Scotch.	J. B. King & Co., New York.
" "	Steel tug.	142	30	16½	80,000	500		Two Scotch.	Builders' account.
" "	Wooden tug.	105	23	12	35,000	120		One Scotch.	F. B. Dalzell & Co., New York.
" "	Wooden tug.	98	20	10½	20 000	90			" "
" "	Steel barge.	217	35	21	50,000	1,200			
" "	Steel barge.	217	35	21	50,000	1,200			
" "	Steel barge.	217	35	21	50,000	1,200			
Jackson & Sharp Co., Wilmington, Del.	Sand barge.	110	26	7½		400			Chas. Warner Co., Wilmington, Del.
" "	Car Float.	250	34	12		1,300			Chesapeake & Ohio R'y Co., Richmond, Va.
" "	Steel elevator.	115	31	12		500			International Elevating Co., New York.
" "	Steel elevator.	115	31	12		500			" "
Neafie & Levy Co., Philadelphia	Tug Swatara.	170							Philadelphia & Reading Co., Phil'a, Pa.
" "	Tug Waban.	100	20	11					M. Revel, Charleston, So. C.
" "	Tug.	148							L. Luckenbach, New York.
" "	Sm. Ycht. Josephine	240	30	18½	300,000		Quad. 19½, 28, 39, 57 x 36,	Two Scotch 14½ x 11, 200.	P. A. B. Widener, Philadelphia, Pa.
" "	Pass. stmr.	260	46	17			Triple 3,200 I. H. P.	Four Scotch.	Balti., Ches. & Richmond Steamboat Co.
" "	Tug.	158							Philadelphia & Reading R'y Co., Phila., Pa.
" "	Tug.	88							" "
Hillman Ship & Eng. Bldg. Co., Phila.	Tug.	140	26	16			Triple.		Staples Coal Co., Taunton, Mass.
" "	Stmr. Nellie Gazzan	65							American Gold Dredging Co.
" "	Barge.	90							" "
Robert Palmer & Son, Noank, Conn.	Wooden barge.	160	35	11		506			Staples Coal Co., Taunton, Mass.
" "	Wooden barge.	160	35	11		506			" "
" "	Wooden barge.	170	35	11		630			" "
" "	Wooden barge.	170	35	11		630			" "
" "	Wooden barge.	170	35	14		700			" "
" "	Wooden barge.	185	35	17½		910			Reading Co., Philadelphia, Pa.
" "	Wooden barge.	185	35	17½		910			" "
" "	Wooden barge.	185	35	17½		910			" "
" "	Wooden barge.	185	35	17½		910			" "
" "	Wooden barge.	185	35	17½		910			" "
" "	Wooden barge.	185	35	17½		910			" "
" "	Wooden barge.	185	35	17½		910			" "
" "	Wooden barge.	185	35	17½		910			" "
" "	Car float.	240	35½	10		850			Harlem Transfer Co., New York.
" "	Wooden car float.	240	35	10		850			Erie Railway Co., Jersey City, N. J.
E. J. Codd Co., Baltimore, Md.	Tug E. J. Codd.	85	20½	11	20,000	202	Comp. 14, 28 x 24.	Scotch 10 x 11.	Philip Weaver & Son, Baltimore, Md.
" "	Tug E. T. Williams	75	21	9	18,000	150	Comp. 13, 24 x 18.	Scotch 9 x 10.	E. T. Williams, Norfolk, Va.
" "	Derrick boat.	72	24	6	5,000	150	2 each 8 x 10.		H. Clay Tunis, Baltimore, Md.
" "	Dredge.	60	28	6					Baltimore Dredging Co., Baltimore, Md.
" "	Fishing stmr.	112	19	8½			Comp. 12, 20 x 20.	Scotch 8 x 11.	Edwards & Reed, Reedsville, Va.
Maryland Steel Co., Sparrow's Pt., Md.	Pass. stmr.	325	48	18			Triple 24, 38, 60 x 30.	Scotch 170.	N. Y. & N. H. St. Co., New Haven, Ct.
" "	Steel Tug.	112	24½	14			Triple 12½, 23½, 39 x 28.	Scotch 170 lbs.	Baker-Whitely Coal Co., Baltimore, Md.
Bath Iron Works, Bath, Me.	Sm. Ycht. Aphrodite	260	35½	22	450,000		Triple 28, 43, 70 x 36.	Four Scotch.	Col. O. H. Payne, New York.
Pusey & Jones Co., Wilmington, Del.	Ferryboat	125	30	10	50,000	300	Beam 30 x 9.	Return tubular 7 x 12.	Pt. Richmond & Bergen Pt. Ferry Co., N.Y.
Geo. Lawley & Son Corp'n, Boston	Sloop yacht.	33	13	11¾	7,000				C. W. Jones, Boston, Mass.
" "	Side wheel stmr.	90	18	7	16,000		Comp. 16, 20 x 36.	Almy	C. H. Jones, Boston, Mass.
" "	Steam launch.	53	9	4½	6,000		Triple 4½, 6½, 12 x 7.	Water tube.	C. Bowland, Boston, Mass.
" "	Steam launch.	60	9½	4¾	7,000		Triple 4½, 6½, 12 x 7.	Water tube.	A. Benney, Boston, Mass
Gas Engine & Power Co., and C. L. Seabury & Co. Con., Morris Heights, N. Y.	Steam steel yacht.	205	24	14			Triple 14, 23¾, 43 x 24.	Four Seabury, 250 lbs.	John P. Duncan, New York.
" " "	Com. steam yacht.	120	16	9½			Triple 8½, 14, 23 x 12.	Seabury, 260 lbs.	Louis Bossert, Brooklyn, N. Y.
" " "	Steel yacht Aria.	135	23	12			Triple.	Seabury.	Edw. H. Blake, Bangor, Me.
" " "	Steel steam yacht.	150					Triple.	Seabury	
Wm. Rogers, Bath, Me.	W. b'ge Kentucky.	237	44	19	50,000	3,000			Atlantic Transportation Co., New York.
" "	W. b'ge West Va	237	44	19	50,000	3,000			" "
" "	W. b'ge Virginia.	237	44	19	50,000	3,100			" "
" "	W. b'ge New York.	237	44	21	55,000	3,200			" "
Moran Bros. Co., Seattle, Wash.	Steel tug.	60	16	9	25,000		Comp. 10, 20 x 16.		
Kelley, Spear & Co., Bath, Me.	Coal barge.	230	43	19	44,000	3,000			Staples Coal Co., Taunton, Mass.
" "	Coal barge.	230	43	19	44,000	3,000			" "
" "	Coal barge.	180	35	16	26,000	1,600			" "
" "	Coal barge.	180	35	16	26,000	1,600			" "
" "	Coal barge.	180	35	16	26,000	1,600			" "
" "	Coal barge.	180	35	17	28,000	1,700			Consolidation Coal Co., Baltimore, Md.
T. S. Marvel & Co., Newburgh, N. Y.	Wooden tug.	6	17	8	13,000	80	Steeple Comp.		Trinidad Shipping & Trading Co., New York.
Thos. McCasker, Baltimore, Md.	Tug.	90	21	10					P. Dougherty Co., Baltimore, Md.
Atlantic Works, East Boston, Mass.	Tug.	125	23½	14	80,000		Comp. 20, 36 x 26.	Scotch.	Haley & Appleton, Boston, Mass.
" "	Tug.	125	23½	14	80,000		Comp. 20, 36 x 26.	Scotch.	" "
H. M. Bean, Camden, Me.	Schr. J. B. Prescott.	282	44	22	90,000	4,500			Capt. J. G. Crowley, Taunton, Mass.
" "	Four masted schr.	205	43	21					Capt. Clarence Birdsall, Tom's River, N. J.
McCausland & Co., Rondout, N. Y.	Wooden barge.	101	31	9	4,500	600			
" "	Wooden barge.	110	32	9	5,000	650			
" "	Wooden barge.	90	28	7	4,000	350			
" "	Wooden barge.	106	31	9	4,500	600			
" "	Wooden barge.	106	31	9	4,500	600			
" "	Wooden barge.	96	21	10½	3,000	500			
Dunn & Elliott, Thomaston, Me.	Schr. C. S. Glidden	187	42½	18	52,000	1,900			Builders' account.

* Hulls for these vessels are building by T. S. Marvel & Co., Newburgh, N. Y.

MERCHANT TONNAGE BUILDING OR UNDER CONTRACT, ETC.—*Concluded.*

BUILDERS.	NAME AND TYPE OF VESSEL.	DIMENSIONS. KEEL	BE'M	DPTH	APPROXIMATE VALUE.	TONNAGE.	ENGINES, DIMENSIONS OF CYLINDERS AND STROKE.	BOILERS—NUMBER, DIMENSIONS AND PRESSURE.	BUILDING FOR
Matthew Turner, San Francisco	Schr. Mascotte.	100	23½	9	13,000	140	Gasoline Engine, 60 H. P.		J. Gesselschaft, Marshall Islands.
" "	Schr. Marshaleen.	66	19	6	4,000	60			"
Jas. M. Bayles & Son, Port Jefferson, N.Y.	Steam yacht.	100	15	8	20,000		Triple, 7, 11, 19 x 10.	Almy, 5 x 7 x 6	
Arthur Sewall & Co., Bath, Me	Steel sailing vessel	320	45	25½		3,200			Builders' account.
Percy & Small, Bath, Me	Wooden schr.	250	44	22	54,000	3,400			"
Wm. H. Baldwin, New Baltimore, N. Y.	Steamer.	135	25	7	25,000				Albany & Troy Steamboat Co., Alb'y, N.Y
Geo. K. Phillips & Co., Bethel, Del	Sailing vessel.	130	28	8	14,000	500			D. J. Foohs & Co., Laurel, Del.
Washburn Bros., Thomaston, Me	Schr. J. C. Haynes.	200	41	19	64,000	2,100	Hoisting, 6¼ x 10.	Upright boiler, 42 inches.	Builders' account.
" " "	Four masted schr.	200	41	19	64,000	2,100	Hoisting, 6¼ x 10.	Upright boiler, 42 inches.	"
" " "	Four masted schr.	200	41	19	64,000	2,100	Hoisting, 6¼ x 10.	Upright boiler, 42 inches.	"
Arthur D. Story, Essex, Mass	Wooden schr.	106	23½	9½	9,000	106			"
" "	Wooden schr.	91	21½	9	7,000	72			"
Sawyer Bros., Millbridge, Me	Three masted schr.	140	35	12	26,000				Capt. F. E. Crabtree, Millbridge, Mass.
" "	Four masted schr.	190	41	17½	48,000				Capt. G. A. Tunnell, M llbridge, Mass.
Lockwood Mfg. Co., East Boston, Mass.	Dble-screw ferryb't	137½	37	14	70,000		Compound, 14, 28 x 24.	Two gun boat, 8 x 19.	City of Boston.
Joseph Supple, Portland, Ore	Stmr. Lorilei.	50	12	3	3,700	15	4 x 16.	Scotch.	Daly & Co., Skagway, Alaska.
" " "	Dredge No. 1.	100	20	5	13,000	125	8 x 36.		M. M. & S. Co., Missouri, Alaska.
" " "	Stmr. Willie Irving	80	20	4	9,000	80	7 x 28.	Roberts.	Capt. Spencer, Lake Bennett.
" " "	Stmr. Kansas City.	80	20	4	10,000	80	7½ x 28.	Roberts.	K. C. Y. M. M. & S. Co., St. Michaels, Al.
" " "	Stmr. City of Chic'o	85	20	4	11,000	85	7½ x 28.	Roberts.	C. A. T. Co., St. Michaels, Alaska.
" " "	Stmr. Anawanda.	48	12	3	3,000	12	4 x 16.	Clyde.	Anawanda, M. & M. Co., St. Michaels, Al.
" " "	Stmr. Inland Flyer	110	18	7	21,000	75	Compound, 12, 18, 18 x 14.	Two Roberts.	Dalles, Portl'd & A. Nav. Co., Portl'd, Ore.
Nathaniel T. Palmer, Bath, Me	Schr. N. T. Palmer.	285	44	22	100,000	2,440			Builders' account.
Cal. Nav. & Impt. Co., Stockton, Cal.	Stern wheel tow b't	105	24	4½	16,000	115	Tandem Comp., 9, 17 x 48.		"
H. Elderkin & Co., Port Greville, N. S.	Wooden schr.	110	32	10½	10,500	500			"
Hay & Wright, San Francisco, Cal	Schr. Robt. R. Huid	162½	37	13	39,000	564			Huid, Rolph & Co., San Francisco.
S. Gildersleeve & Sons, Gildersleeve	Barge Marion. (Wooden b'ge)	121	27	12½	5,000	900			J. W. William, Dan, N. Y.
" "	Barge Sarah. (Wooden b'ge)	108	27	12½	4,800	800			Builders' account.
" "	Barge Ellen. (Wooden b'ge)	108	27	12½	4,800	800			"
" "	Barge Emily. (Wooden b'ge)	105	24	12½	3,500	650			Lehigh Coal & Navigation Co.
" "	Barge Kate. (Wooden b'ge)	105	24	12½	3,500	650			"
" "	Barge Louisa. (Wooden b'ge)	93	24	12½	3,300	550			Builders' account.
" "	Barge Alice. (Wooden b'ge)	93	23	12½	3,300	525			"
Lewis Nixon, Elizabethport, N. J.	Stmr. Pathfinder.	165	33½	20			Triple.		U. S. Coast Survey, Washington, D. C.
" "	Steam yacht.	165	33½	20			Triple.		
A. W. Hepburn, Picton, Ont	Sidewheel pass. str.	192	27	11½	95,000		44 in. x 10 ft	Scotch, 10 x 12.	Lake Ontario Nav. Co.
Spedden Ship Building Co., Baltimore, Md.	Tug Scandinavia.	75	17	8½			Compound.		Baker-Whitely Coal Co., Baltimore, Md.
" "	Tug Solicitor.	75	17	9			Comp und, 10, 20½ x 20.	Scotch, 8 x 10.	Lewis Wagner Lumber Co., Baltimore, Md.

VESSELS UNDER CONTRACT IN SHIP YARDS OF THE GREAT LAKES—JANUARY, 1899.

BUILDERS.	TYPE OF VESSEL.	DIMENSIONS. Keel.	Beam.	Depth.	APPROXIMATE VALUE.	ESTIMATED CAPACITY, GROSS TONS.	ENGINES—DIMENSIONS OF CYLINDERS AND STROKE.	BOILERS—NUMBER, DIMENSIONS, PRESSURE.	BUILDING FOR
American Steel B'ge Co., W. Superior, Wis.	Bulk oil barge	200	38	17	$ 85,000	**		Pony for windlass, etc	Standard Oil Co., New York.
American Steel B'ge Co., W. Superior, Wis.	Steel tow barge	446	50	29½	175,000	7,200		Pony for windlass, etc	Bessemer S. S. Co., Cleveland.
Bertram Engine Works Co., Toronto, Ont.	Steel tug	80	16	7	10,000		Comp., 11, 20 x 14	One Scotch	Collins Inlet Lumber Co., Toronto, Ont.
Bertram Engine Works Co., Toronto, Ont.	Steel pass. stmr.	85	16	5½	8,000		Comp., 9, 18 x 12	Fitzgerald, 54 in. x 8 ft.	Capt. Reynolds, Peterboro, Ont.
Craig Ship Building Co., Toledo, O.	Steel frt. stmr.	250	42	24	130,000	3,000	Triple, 19, 30, 52 x 40	2 Scotch, 12 x 12½—175	Builders' account.
Chicago Ship Building Co., Chicago	Steel pass. stmr.	225	40	16	175,000		Triple, 20, 33, 54 x 36	2 Scotch, 12½ x 11½	Nor. Mich. Trans. Co., Chicago.
Chicago Ship Building Co., Chicago	Steel frt. stmr.	430	50	28½	230,000	6,400	Quadruple, sizes not fixed	Bab. & Wilcox, water tube	Minnesota S. S. Co., Cleveland.
Chicago Ship Building Co., Chicago	Steel tow barge	436	50	28½	170,000	7,000		Pony for windlass, etc	Minnesota S. S. Co., Cleveland.
Cleveland Ship Building Co., Cleveland	Steel frt, str.	444	50	29	230,000	6,900	Triple, 23, 34, 62 x 40	3 Scotch 12-4 x 12—170	Wilson Transit Co., Cleveland.
Cleveland Ship Building Co., Cleveland	Steel frt. str.	432	50	28	230,000	6,400	Quadruple, sizes not fixed	Bab. & Wilcox, water tube	A. B. Wolvin, et al., Duluth.
Cleveland Ship Building Co., Cleveland	Steel frt. str.	238	42	26½	135,000	3,000	Triple, 18½, 31½, 51 x 36	2 Scotch, 11 x 12—170	W. A. Hawgood, et al., Cleveland.
Calvin Co., Garden Island, Ont	Wood frt. stmr.	212	37	15	90,000	2,500	Triple, 18, 30, 48 x 30	2 Scotch, 11½ x 12—160	Calvin Co., Garden Island, Ont.
Detroit Dry Dock Co., Detroit	Steel pass. str.	190	25	12½	130,000		Beam type	Scotch type	E. H. McFall, Sandusky.
Detroit Dry Dock Co., Detroit.	Steel tug	85	19½	11	40,000		Comp., 15, 30 x 20	Scotch, 10½ x 10—125	Cpt. H'ry Taylor, U.S.A., Seattle, Wash.
Davidson, James, West Bay City, Mich	Wood schr	325	45½	26	90,000	4,600		Pony for windlass, etc	Builders' account.
Davidson, James, West Bay City, Mich.	Wood schr	325	45½	26	90,000	4,600		Pony for windlass, etc	Builders' account.
Globe Iron Works Co., Cleveland	Steel frt. stmr	455	50	29	255,000	6,100	Qu'd'ple, 26½, 37, 54½, 80 x 42	4 Scotch, 13-4 x 11-8½—200	Bessemer S. S. Co., Cleveland.
Globe Iron Works Co., Cleveland	Steel frt. stmr	410	50	28	220,000	5,600	Triple, 23, 37½, 63 x 42	3 Scotch, 12 x 12½—185	John Mitchell et al., Cleveland.
Heath, E. W., Benton Harbor, Mich.	Wood tug	90			15,000		Sheriff's type		Milwaukee Tug Boat Co., Milwaukee.
Heath, E. W., Benton Harbor, Mich.	Yacht Thetis				7,000				J. H. Broughton, Chicago.
Hingston & Woods, Buffalo	Dipper dredge	136	42½	13½	80,000		Four of Bucyrus Co.'s make	Ret. flue, 8½ x 12—150	Hingston & Woods, Buffalo.
Jenks Ship B'ldg Co., Port Huron, Mich.	Steel pckg. frt. str.	240	43	27	140,000	3,000	Triple, 17, 28, 47 x 40	2 Scotch, 11 x 12	Builders' account.
Johnson Bros., Ferrysburg, Mich.	Steel fish tug				5,000				Ver Duin Bros., Grand Haven, Mich.
McKinnon Iron Works, Ashtabu'a, O.	Steel tug	32	8		3,000		High pressure, small		
Simpson, M., Toronto, Ont	Screw pass. stmr.	100	21	7	11,000		Comp., 10, 20 x 16	Fitzgerald, 5½ x 8 ft	Ottawa River Nav. Co., Montreal.
Union Dry Dock Co, Buffalo	Steel pckg. frt. str.	402½	52	28	220,000	5,100	Quadruple, sizes not fixed	3 Scotch, 12½ x 12—210	Western Transit Co., Buffalo.

** 625,000 gals of oil.

VESSELS BUILDING OR UNDER CONTRACT ON WESTERN RIVERS OF AMERICA—JANUARY, 1899.

BUILDERS.	TYPE AND NAME OF VESSEL.	Keel.	Beam.	Depth.	APPROXIMATE VALUE.	Tonnage.	ENGINES—TYPE, SIZE CYLINDER.	BOILERS—NUMBER, TYPE AND SIZE.	BUILDING FOR
Cincinnati Marine Ways, Cincinnati, O.	Stern wheel stmr	132	32	6½	$16,000	480	12 x 54	42 in. x 18 ft	Kentucky River Packet Co.
" "	Stern-wheel stmr	120	20	3	9,000	182	8 x 36	Scotch	Cumberland River Packet Co.
" "	Barge	130	20	7	8,000	950			U. S. Govt.
" "	Barge	130	20	7	8,000	950			U. S. Govt.
Andrew Axton & Son, West Brownsv'e, Pa.	Tow b't R. McKinley	130	22½	4	12,000		16 in. x 6 ft		McKinley Coal Co., Pittsburg, Pa.
" "	Tow boat	135	24	4	25,000		Comp., 11 and 22 in. x 7 ft		Vesta Coal Co., Pittsburg, Pa.
East Side Docking Co., Mobile, Ala	St'n w. str. C'y Mobile	175	34	4	25,000	209	15 in. x 5 ft	12 in. x 20 ft	People's Line, Montgomery, Ala.
" "	Str. City of Demopolis	70	14	3	5,000	30	7 x 28	Roberts	
David S. Barmore, Madison, Ind	Stmr. Spread Eagle	235	38	6	45,000	1,000			Eagle Packet Co., St. Louis.
" "	Wooden barge	135	28	5	4,700	500			St. Louis & M. R. Trans. Co., St. Louis.
" "	Wooden barge	135	28	5	4,700	500			" " " "
" "	Wooden barge	135	28	5	4,700	500			" " " "
" "	Wooden barge	135	28	5	4,700	500			" " " "
" "	Wooden barge	135	28	5	4,700	500			" " " "
" "	Wooden barge	135	28	5	4,700	500			" " " "
Iowa Iron Works, Dubuque, Ia	Tow boat	125	20	10			Comp., 800 I. H. P.		St. Louis Transfer Co.
Chas. Barnes Co., Cincinnati	Tow boat St. Vallier.	75	17	3	15,000	75			Sta. Anna Mining Co., Kingsman, Ar.
" "	Wooden hull	55	12	2½	4,000	50			Capt. Zinn, U. S. Eng., Louisville, Ky.
Jas. Rees & Sons Co., Pittsburg, Pa.	Stern wheel stmr	115	24	4	90,000	150	10 x 4½	Yarrow water tube	Canad'n Dev'l'pm't Co., L. Bennet, B.C.
M. G. Knox & Son, Marietta, O.	Stmr. City of Pittsb'g	290	48	6	75,000	1,200	30 in. x 10 ft	3 Scotch	Scott & Phillips, Pittsburg, Pa.
Capt. Ed. Howard, Jeffersonville, Ind.	Stmr. America	200	38	7½			18 in. x 8 ft	32 ft. x 44 in	Capt. L. V. Cooley, New Orleans, La.
" "	Tow b't Wm. R. King	200	40	6			24 in. x 10 ft	23 ft. x 40 in	Mississippi River Com., St. Louis.
Jacob Richtman & Sons, Elsberry, Mo	T'wbt. J. M. Richtman	120	23	4	12,000	150	12 in. x 6 ft	40 in. x 16 ft	J. Richtman & Sons, Elsberry, Mo.

LATEST CONTRACTS

A VARIETY OF INFORMATION REGARDING NEW ORDERS RECENTLY CLOSED AND NOT INCLUDED IN THE TABLES OF TONNAGE UNDER CONSTRUCTION—YACHTS, SAIL BOATS AND SMALL CRAFT OF ALL DESCRIPTIONS — GREAT ACTIVITY AMONG ENGINE AND BOILER MANUFACTURERS.

H. J. Crocker of New London, Conn., has sold out his ship building business.

The George Lawley & Son, Corporation, South Boston, Mass., is building eight small sail yachts.

All the vessels building by Stanley C. Vansant of Atlantic City, N. J., are from Mr. Vansant's own designs.

Walter H. Oades of Detroit, Mich., is rebuilding the schooner yacht Roberta and the burned steambarge Nipigon.

Capt. Charles Young of Gloucester, Mass., is having a $10,000 fishing vessel of 101 feet length built at Essex, Mass.

Wm. Heller of Eastport, Md., is rebuilding the schooner Ella Worden, a vessel of 60 feet keel, 18 feet beam and 5 feet depth.

Joseph L. Harrison of Tilghmands, Talbot county, Md., is building on his own account a yacht of 32 feet over all, which is valued at $500.

The Union Marine Railway of Provincetown, Mass., which was destroyed in the fierce storm of the latter part of November will not be rebuilt.

The Providence Dry Dock & Marine Railway Co. of Providence, R. I., reports that the capacity of their plant is being tested by the repair work on hand.

The Benton Transportation Co. has announced its intention of discontinuing business at Sioux City, Iowa, and will therefore not accept any more contracts to build vessels.

W. B. Stearns, Marblehead, Mass., is building two cutter yachts, each 30 feet keel by 12½ feet beam. They are valued at $7,500 each. He also has on hand other orders amounting to $5,000.

B. F. Jackson of Kennebunkport, Me., is building a sail yacht for J. Trambley of Saco, Me. She will be 25 feet keel, 10 feet beam and 5 feet depth, and will cost in the neighborhood of $800.

The Diamond Jo Steamship line of Dubuque, Ia., is expending $30,000 in rebuilding the Sidney, a steamer of the regular Mississippi river type, and 220 feet keel, 37 feet beam and 5 feet depth.

The Brunswick Foundry Machine & Manufacturing Co. of Brunswick, Ga., is rapidly repairing the damage recently done to its plant by fire, and will in the near future be better equipped than ever.

The Whitelaw Wrecking Co. of San Francisco, Cal., announce that they will in March begin building on their own account a $50,000 wrecking steamer, which will be 145 feet keel, 34½ feet beam and 12 feet depth.

Samuel H. Pine, veteran ship builder of 139 Noble street, Brooklyn, N. Y., writes the Review that he has been in the ship building business for fifty-three years and during that time has built or helped to build 175 vessels.

H. C. Burleigh & Bro., Whitehall, N. Y., builders of the Defender and Nirvana, report that there is a strong probability that they will in the near future secure the contract for another boat to be ready early next summer.

Jacob Richtman & Sons, Elsberry, Mo., are building for their own use at Fountain City, Wis., eleven barges, each 100 feet long, 20 feet beam and 4 feet depth. The vessels are built of Washington fir and are valued at $700 each.

John M. Brooks, 29 Coleridge street, Harbor View, East Boston, Mass., is supplying the compound engine and boilers for the ferryboat building for the city of Boston and also has a $16,000 contract for ferry slips and tanks.

The Yarrow water tube boilers for the stern wheel steamer building by James Rees & Sons Co. of Pittsburg, Pa., for the Canadian Development Co. of Lake Bennet, B. C., will be furnished by the W. & A. Fletcher Co., Hoboken, N. J.

Joseph Supple, Portland, Ore., ship builder, handled an immense amount of repair work during the year just closed. He says that he considers the outlook for 1899 excellent, and has on hand several orders upon which he is preparing to begin work.

Josiah Batchelder of Stillwater, Minn., is rebuilding the United States steamer Fury of the river improvement service. Bronson & Folsom, also of Stillwater, saw mill owners and lumbermen, have taken the contract for rebuilding the steamer Isaac Staples.

The West & Slade Mill Co. of Aberdeen, Wash., has leased its ship yard to J. Linstrom, who will, within the next thirty or sixty days, start a three-masted schooner of about 300 tons. The mill company will in all probability build no vessels during the present year.

N. Blaisdell, boat builder, of 289 Front street, Bath, Me., is rushed with work. Among orders which he is hurrying to get out is one for a set of boats for the steel sailing vessel building by Arthur Sewall & Co. of Bath. The price for the set of four is in the neighborhood of $400.

The Robertson Raft Co. of West Seattle, Wash., evidently anticipates launching other immense rafts like those which caused so much discussion when towed down the Pacific coast last season, as it has now building an immense cradle capable of accommodating a raft of the largest type.

Sherwood, Embree & Bro. of Quincy Point, Mass., write the Review that the damages to yachts along that portion of the coast by the storms of the past two months will aggregate fully $8,000. Their repair yard is very busy in consequence. They are also building about twenty yacht tenders.

Orders recently booked by the Fore River Engine Co. of Weymouth, Mass., include one for a compound engine with cylinders 12 and 24 inches by 16 inches stroke for the yacht Arenal, and for two triple expansion engines for yachts, the dimensions of cylinders being 7, 11½ and 19 inches by 10 inches stroke.

The Quincy Marine Ways, Quincy, Ills., has been very busy for some time past, their work being confined for the major part to the hauling out and repairing of river steamers and barges. The only new construction upon which they have been engaged is flatboats, dumping scows and minor craft of various kinds.

The Cape Cod Yacht Agency of Barnstable, Mass., have recently given estimates to a considerable number of prospective purchasers of vessels of various types. They have all but closed a contract for a 21-foot "race-about" for Boston parties and for a 30-foot cruising yawl for a New York gentleman.

Andrew Axton & Son of West Brownsville, Pa., report great activity in business and excellent prospects for the closing of several additional contracts within a few days. Machinery for the two towboats now under construction by Axton & Son is being manufactured by the Marietta Manufacturing Co. of Marietta, O.

N. Blaisdell of Bath, Me., is building the sloop yacht Dorinda, 31 feet over all and valued at $600 for Philip Blaisdell of 1033 High street, Bath, Me. Among the small boats building at the Blaisdell yard are four for the steel sailing ship Arthur Sewall, building by Arthur Sewall & Co. of Bath, Me. The contract price for the four is $400.

Two schooners which Matthew Turner of 40 California street, San Francisco, Cal., is building, and which are listed elsewhere in this issue, although contracted for by Jaliut Gesselschaft, who is engaged in trading enterprises in Hamburg and the Marshall islands, are in reality to be owned by one of the native chiefs of the islands mentioned.

C. F. Brown, Pulpit Harbor, North Haven, Me., is building a number of small craft. Among those under way are a 28-foot, $750 launch for J. Murray Howe of Boston, Mass.; 25-foot, $2,000 sail yacht for George S. Sigsbee of Boston; 20-foot, $800 knockabout for William D. Minturn, New York; 20-foot, $800 knockabout for James Lawrence of Groton, Mass.

The Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y., have, in addition to their contracts for torpedo boats and four steam yachts, orders for eight steam tenders for government transports and thirty-five naptha launches for private parties. The magnitude of the business conducted by this company may be appreciated when it is stated that they keep regularly in stock about sixty-five naptha launches.

David S. Barmore, proprietor of the Madison Marine Railway & Ship Yard at Madison, Ind., writes that he is overwhelmed with orders. Among the contracts now under way are the rebuilding of the steamer Big Kanawha at a cost of $20,000 for F. A. Laidley of Cincinnati; rebuilding the passenger and freight steamer Levi J. Workam, owned by Freiburg & Workam of Cincinnati at a cost of $25,000; and rebuilding the railroad transfer steamer John Bertram for the Illinois Central Railroad Co. at a cost of $35,000.

Rice Brothers, East Boothby, Me., are building a yawl rigged yacht 76 feet over all, 17½ feet beam and 7½ feet draught, valued at $12,000, for W. E. Barrett of Massachusetts. She was designed by B. B. Crowninshield of Boston, Mass. Other vessels building at their yard are a 30 foot naptha yacht equipped with a Wolverine gasoline engine and valued at $1,500, for Walter S. Weston, Hyde Park, Mass., and a 35-foot naptha yacht with a 12 horse power Wolverine engine building on their own account. The latter is valued at $2,500.

NEW WORK IN SHIP YARDS OF THE GREAT LAKES.

The following table shows number, capacity and value of new ships under contract in yards of the great lakes in January of each year for thirteen years past. At present there are in all twenty-six vessels building in the lake yards, and their approximate aggregate value is $2,974,000. This is considerably less than the value of vessels building a year ago, when two or three large passenger steamers helped to swell valuations. Last year there were several wooden vessels building at different small yards around the lakes, but this year the new wooden tonnage is practically confined to the two barges building at the works of James Davidson, West Bay City, Mich. Of the twenty-six new vessels, thirteen are freight carriers of 71,400 gross tons capacity.

VESSELS UNDER CONTRACT IN LAKE SHIP YARDS, JANUARY OF EACH YEAR DURING THIRTEEN YEARS PAST.

JANUARY.	Number of Vessels.	Valued at	Capacity of Freight Vessels, Gross Tons.
1886	31	$4,074,000	65,750
1887	60	8,325,000	108,525
1888	59	7,124,000	100,950
1889	56	7,866,000	124,750
1890	38	5,337,000	77,950
1891	45	4,896,000	76,000
1892	49	6,909,500	68,470
1893	28	2,538,500	26,400
1894	29	2,932,500	33,150
1895	65	8,549,000	136,600
1896	31	2,898,000	69,255
1897	40	4,385,600	77,100
1898	26	2,974,000	71,400

It will be noted that this year the Jenks Ship Building Co. of Port Huron, enters the list of steel builders on the lakes. They have begun work on engines and boilers for a steel package freight steamer of 3,000 tons, and will have a yard equipped shortly for the building of the hull.

THE FOUR ADMIRALS.

VESSELS CONSTRUCTED BY THE CRAMPS FOR THE AMERICAN MAIL STEAMSHIP CO.—THEY MAY BE READILY CONVERTED INTO AUXILIARY CRUISERS—BUILT UNDER MAIL SUBSIDY ACT.

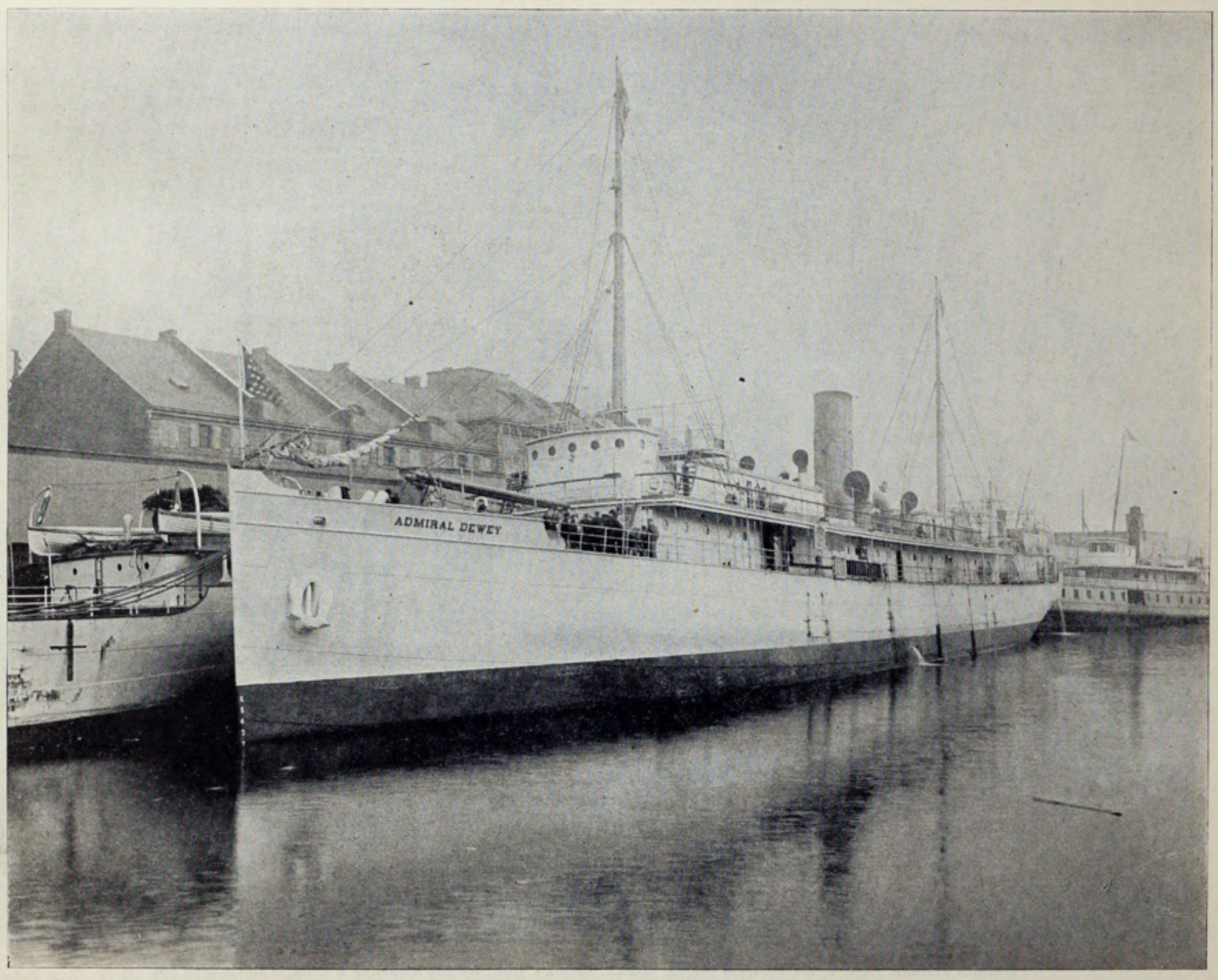
The exigencies of the late war did not afford the only opportunities of the year for a demonstration of the capabilities of American ship builders in the matter of rapid construction work. There were, especially during the latter half of the year, several instances where contracts were executed in a most expeditious manner, but it may be said with entire consistency that in no case was a more creditable record made than that of the William Cramp & Sons Ship & Engine Building Co. of Philadelphia, in the construction of what is known as the Admiral class of steamers for the American Mail Steamship Co. of 100 Broadway, New York City. The keels for these vessels were not laid until early in the summer of 1898 and the opening of the new year finds them all four in commission, or at least practically completed so far as the builders are concerned.

These vessels were built with especial reference to the requirements of the Boston Fruit Co., to which they were chartered for a period of ten years before work on them was begun. It was the original intention to name the vessels for counties and cities in Massachusetts, after the plan previously followed in christening vessels intended for the service of the fruit company, but the victories of the Spanish-American war suggested a different form of appellation, and the names Admiral Dewey, Admiral Sampson, Admiral Schley and Admiral Farragut were accordingly selected. The Admirals are 282 feet over all, 36 feet beam, 24 feet deep and of 2,000 gross tons register. They have been so constructed as to enable in the event of necessity, their prompt and economical conversion into auxiliary cruisers of the navy, capable of mounting four rapid fire guns of not less than 6-inch calibre. Each has accommodations for ninety saloon passengers and a crew of 170 officers and men. The plan of the steamer Beverly, for some time past in the service of the Boston Fruit Co., was resorted to to furnish the fundamental principles of the plan for the new ships, but in the latter many improvements have been incorporated. One of these is found in the increased freeboard, the vessels of the Admiral class having 13 feet freeboard amidships, 19 feet forward and 12 feet aft.

Staterooms on these vessels are all forward of the engine well and are, therefore, free from disagreeable vibration and the heat and dirt from the boilers. Opening off the main saloon on the main deck are eighteen staterooms finished in white enamel ornamented with gold and fitted with the finest upholstery. At the rear of this saloon on either side are the lavatories and baths, and from the saloon a handsome staircase leads to the house on the bridge deck above. On this deck are located six staterooms, the captain's room, chart room and pilot house, while in the rear are the music room, library and smoking room. The holds of the vessels are, of course, provided with water tight bulkheads.

Propelling engines are of the vertical triple expansion type, with cylinders 18, 28 and 45 inches by 30 inches stroke, developing 2,500 indicated horse power. The engines are designed to give 148 revolutions, the propellers being of the three bladed type. Steam is supplied from two Scotch boilers, 15 feet 6 inches in diameter by 11 feet 6 inches in length, capable of 160 pounds pressure and equipped with forced draught. Morison furnaces are used. The steamers are fitted with electric light plants of the modern type. They are equipped with steam windlasses manufactured by the American Ship Windlass Co., Worthington pumps, steering engines of the kind manufactured by Williamson Bros. of Philadelphia, and Baldt stockless anchors.

Subsidies which this fleet will receive from the government will aggregate about $120,000 annually. It is stipulated in the government contract that the steamers must be capable of making 60 knots in four hours steady steaming, but none of the four had any difficulty in attaining a speed in excess of this figure. It is further provided in the subsidy act that each steamer shall carry a midshipman and a cadet. As above stated, each vessel is provided with permanent gun mounts. All four vessels will be employed regularly in the Jamaica fruit trade, and some idea of their capacity may be gained from the statement that each can readily accommodate a cargo of 43,000 bunches of bananas, a larger consignment than has been transported by any single steamer previous to their construction. It may be interesting to note also that the Boston Fruit Co., to which these vessels are under charter, has about twenty vessels regularly employed in its service and last year delivered to the ports of New York, Boston, Philadelphia and Baltimore a total of 6,000,000 bunches of bananas, 10,000,000 cocoanuts, 5,000 bags of pimento, 36,000 packages of oranges and 2,000 bags of cocoa and coffee.



Steamer Admiral Dewey, Built by the Cramps for the American Mail Steamship Co., of New York.

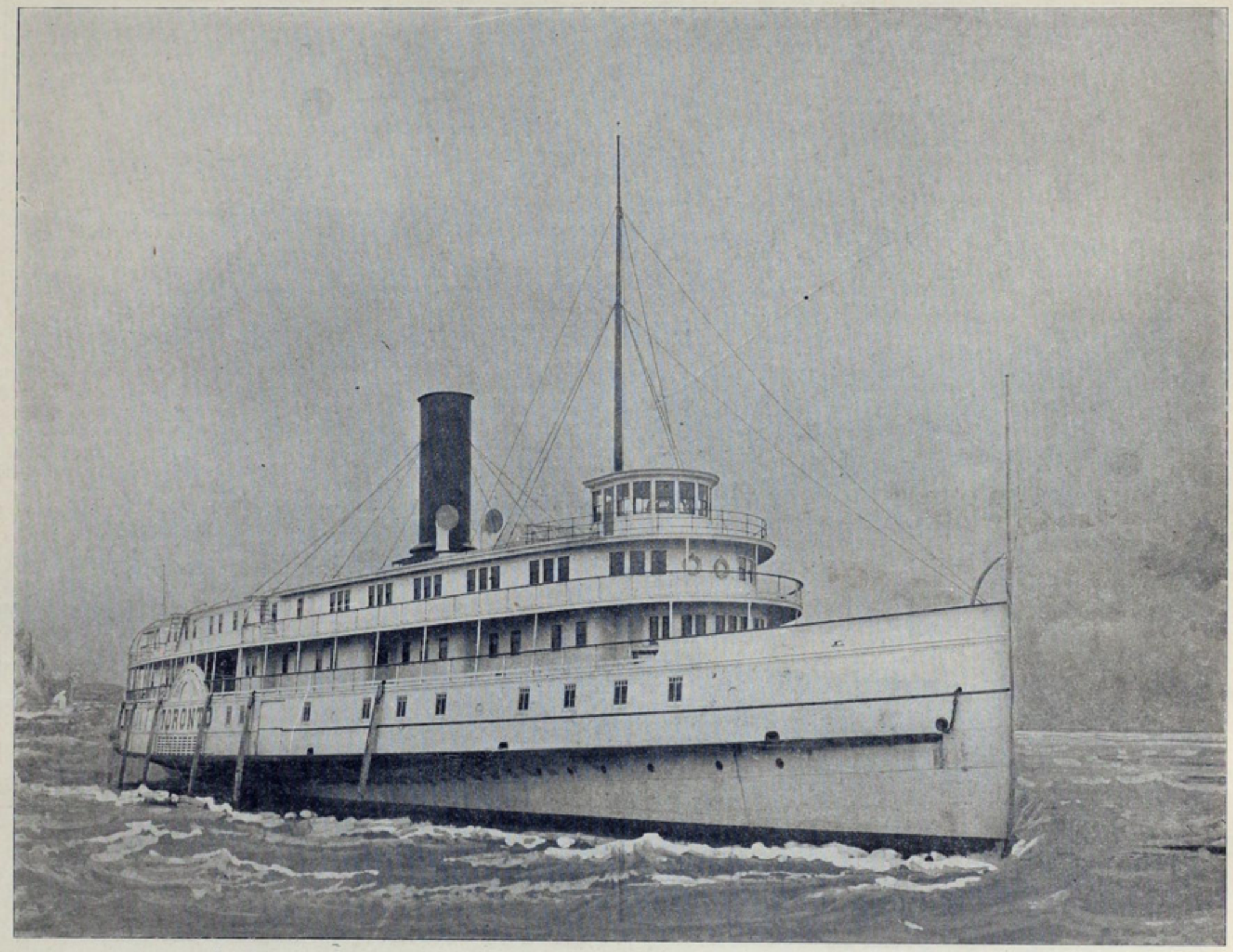
S. B. Greacen, engine manufacturer of Perth Amboy, N. J., is building compound engines for several vessels. For the steam lighter Ruth, owned by J. M. Worth of New York, he is providing an engine with cylinders 11 and 29 inches by 18-inch stroke; for the tug John D. Dailey, cylinders 14 and 37 inches by 20 inches stroke; for the steamer Harlem River, cylinders 12 and 31 inches by 16 inches stroke; and for the Merritt Wrecking Co.'s steamer William Coley, twin screw engines with cylinders 9½ and 25 inches by 16 inches stroke.

M. P. Brown, 314 North West street, Syracuse, N. Y., whose ship yards are at Baldwinsville, N. Y., writes to the Review that although he has no vessels on the stocks now he expects to build a boat this winter.

FAST SIDE-WHEEL STEAMER.

TWENTY-MILE BOAT FOR LAKE ONTARIO SERVICE OF RICHELIEU & ONTARIO CO.—BUILT BY BERTRAM ENGINE WORKS CO., LTD., OF TORONTO.

With the opening of the passenger season on Lake Ontario and the St. Lawrence river next summer, one of the finest side-wheel passenger steamers on the entire chain of lakes will enter the service of the Richelieu & Ontario Navigation Co. The vessel is the Toronto, just completed by the Bertram Engine Works Co., Ltd., of Toronto. It was the intention to build two steamers like the Toronto for the Lake Ontario service of the Richelieu company, but the construction of the second vessel is delayed, pending the settlement of plans of the steamboat company regarding new vessels of canal and river type, to run down the St. Lawrence in connection with the Lake Ontario ships. As a ship marking the reconstruction of the Richelieu & Ontario Co.'s fleet, the Toronto is certainly a vessel to be proud of. She is much like the Detroit & Cleveland Nav. Co.'s steamers City of Alpena and City of Mackinac, in Lake Huron service, but with inclined triple expansion engines, Howden hot draft and a successful general arrangement of power; she is capable of a speed of 20 miles an hour, and will be pronounced an especially comfortable passenger



Steamer Toronto, Built at the Bertram Engine Works, Toronto, Ont., for the Richelieu & Ontario Navigation Co.

ship from the fact that there is probably no vessel in the country more free than she is from vibration.

Although the Toronto was not finished in time for service last season, and has not as yet been introduced to the patrons of the Richelieu & Ontario Co., her trials on Lake Ontario were had late in November and particulars of them have been received by the Review. In these trials the Bertram company was represented by Mr. A. Angstrom, who designed the vessel, and the steamboat company by Mr. C. B. Calder of the Dry Dock Engine Works of Detroit, acting for Mr. Frank E. Kirby, consulting engineer of the steamboat company. A part of the cabin work was incomplete, and the electric light plant and other equipment had not been installed, so that there was some insufficiency in weights for trial, but this was made up by taking aboard considerable pig iron and by carrying water ballast.

The hull of the Toronto is constructed of open hearth steel and of the following dimensions: Length over all, 278 feet; length, keel, 270 feet; beam, molded, 36 feet; beam, over guards, 63 feet; depth, molded, 14 feet. Engines are of the triple expansion, inclined jet-condensing type, with cylinders 28, 44 and 74 inches by 72-inch stroke. The feathering paddle wheels are 22 feet outside diameter and 10 feet 3 inches face of bucket. Air and feed pumps are attached to and worked from main engine. Boilers, four in number, are of the return tubular type, 11 feet diameter and 11 feet 6 inches long over heads. Each boiler has two 41½-inch outside diameter Morison suspension furnaces. They are fitted with the Howden hot draft and are designed for a working pressure of 175 pounds.

Spacious and elegant passenger accommodations are provided. One hundred and forty state rooms, including four parlor rooms and large Pullman sleeping cabin, furnish sleeping accommodation for 430 passengers. The dining room, placed on an upper deck, has a seating capacity for over 100 persons. The interior finish and decorations of the spacious halls and deck saloons are most elaborately executed, the main and gallery saloons being finished in Francis I. Renaissance, with the dining room in Louis XVI. The entrance hall is decorated in Neo-Grec with modern Renaissance details, with the smoking room in Oriental treatment. The refreshment and writing rooms are in Elizabethian paneling of prima vera, natural wood finish. The main stair cases are in Honduras mahogany with wrought metal balustrades in hammered leaf work, finished antique bronze, the main newels carrying bronze figures supporting electric torches.

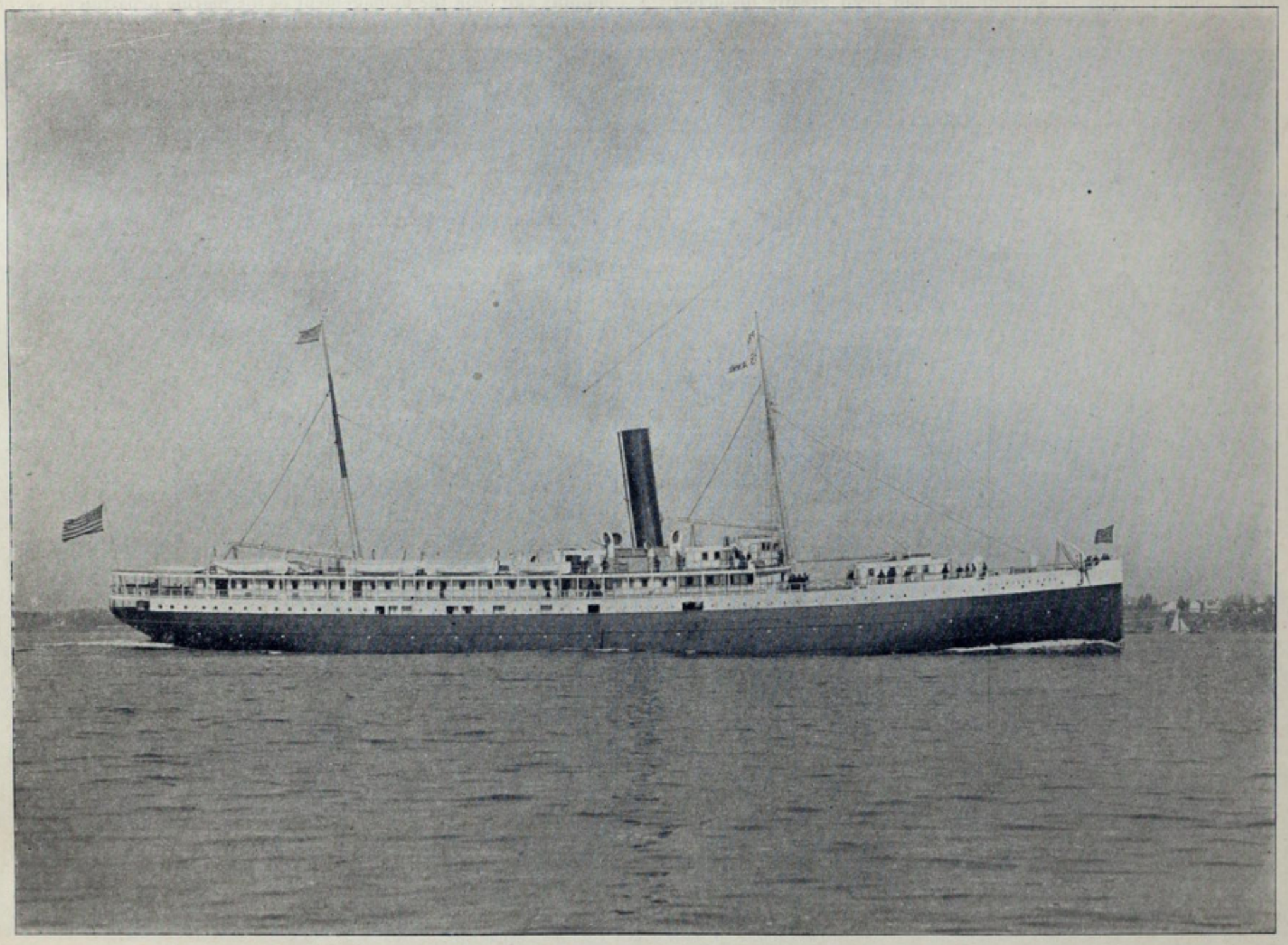
The vessel was given two trials, Nov. 28 and Nov. 29. The main object of the first trial (Nov. 28) was to ascertain the coal consumption—that is how many pounds of coal were consumed per indicated horse power per hour. The engines were indicated during the progress of trial (3 hours, 43 minutes) with the following results: Steam by gauge, mean during trial, 155 pounds; vacuum, mean, 24½ inches; revolutions, 34.2; mean draught of steamer during trial, 7 feet 7¾ inches; displacement corresponding to this draught, 1,160 net tons; coal burned, entire trial, 12,747 pounds; I. H. P., mean during trial, 1,878; coal per I. H. P. per hour, 1.82 pounds. The steamer was also run on a 19-mile course during this trial and the accurate time noted. The course was from Oakville light-house to the Toronto light on Toronto island, known as Gibraltar light. This stretch of 19 miles was covered in just 60 minutes, or at the rate of exactly 19 miles an hour. The total of engine revolutions over the 19-mile course was 2,047. The performance of the steamer during this trial was most satisfactory the engines working perfectly and the boilers furnishing steam with the greatest ease—in fact the greatest difficulty during the trial was to keep the steam from blowing off through the safety valves. On account of one of the safety valves blowing off slightly earlier than the others, the steam was kept somewhat lower than it otherwise would have been. On the subsequent trial (Nov. 29) the steam pressure was, however, kept up to that allowed by Canadian inspection law, and a maximum power trial took place. Neither the boilers nor side pipes on engine were lagged.

The second trial (Nov. 29) was made for the purpose of ascertaining the greatest number of revolutions for which the boilers could continuously and comfortably furnish steam and also to record the speed with this number of revolutions. The steamer was run on the same course as the previous day, and a record of time, revolutions, steam gauges, etc. carefully taken, the same as on the previous day, but the engines were not indicated for power. The record of this trial is as follows: steam pressure by gauge, mean over course, 175 pounds; vacuum, 23½ inches; revolutions, mean over course, 36.87; mean draught of ship, 7 feet 7 inches;

displacement corresponding to this draught, 1,148 net tons; time over course, 58¼ minutes; distance, 19 miles; speed, 19.6 miles per hour.

During both trials there was a total absence of vibration in any part of the steamer. The whole of the joiner work was without the support of the interior paneling—in fact only standing on the studs—which makes the entire absence of vibration the more noteworthy. There was also an entire absence of the jerky movement of the boat, so frequently found in paddle-wheel steamers with other types of engines. The steamer handled exceedingly well—that is answered her helm quickly—and there was no noticeable heel even when the helm was hard over. It is expected that in the finished condition the stability and stiffness of the boat will be quite satisfactory, as the center of gravity would not materially change from the present position, the larger part of the temporary load put in during trials being placed on the main deck. During a previous trial to the two above recorded, the steamer met with quite a heavy sea and was on purpose run before the wind with the sea from the after quarter, when she, like all steamers of this type, accumulated a rolling motion, this motion, however, being of long period and quite easy. With sea dead abeam the rolling was slight, and from all other quarters there was no rolling. The steam steering gear was used during the trials and worked most satisfactorily, the steering engine working quietly, without racing, and the gear in the pilot house could be operated with ease by a boy.

The Howden hot draft, applied to the boilers under rights of the Dry Dock Engine Works of Detroit, was operated during the two trials and proved entirely satisfactory, the boilers furnishing an abundance of steam, even during the full power test. The coal consumption per indicated horse power must be considered for this type of engine, particularly with the condition of the boilers (unlagged), to be entirely satisfactory, in fact lower than any on record for a side-wheel steamer—and considerably lower than that guaranteed in the builders' contract.



Princess Anne, Exact Duplicate of the Steamers Hamilton and Jefferson, Building at the Roach Ship Yard, Chester, Pa., for the Old Dominion Steamship Co.

BUSY ROACH SHIP YARD.

THE SPLENDIDLY MANAGED PLANT AT CHESTER, PA., CROWDED WITH WORK—OLD DOMINION LINE STEAMERS HAMILTON AND JEFFERSON READY FOR LAUNCHING.

Among the ship yards of America few have had a longer and more honorable career than the Roach Ship Yard of Chester, Pa., known also by the corporation name, Delaware River Iron Ship Building & Engine Works. It is doubtful if the famous founder of these works, who has sometimes been termed "the father of American ship building," ever anticipated in his most sanguine hopes the condition of prosperity at which the establishment has now arrived. There are building or under contract at this yard at present nine vessels of an aggregate value of more than $1,500,000, and this includes no naval work whatever. Moreover, more contracts are in sight, and the management is hurrying work upon improvements that have been contemplated for some time, in order to increase the capacity of the yard.

One of the most important contracts now on hand is for the single-screw steel steamers Hamilton and Jefferson, building for the Old Dominion Steamship Co. of New York. A picture of the steamer Princess Anne, of which these new vessels are in every respect an exact duplicate, is herewith presented. It was the record which the Roach yard made in its construction of the Princess Anne that aided in securing to it without any hesitation whatever the award of the contract for these new vessels. The contract for the Princess Anne was awarded to the Roach company on Nov. 16, 1896, they agreeing to deliver the vessel by August 1, 1897, while the minimum time offered by other bidders was twelve months. Predictions of failure were numerous, but the builders kept their promise and delivered the vessel complete in 240 days, a record which had not at that time been equalled in the United States. Naturally when the Old Dominion people decided to build two more vessels for their service between New York, Norfolk, Va., and other points, they were disposed to favor the Chester firm.

These steamers are each 322 feet over all, 304 feet keel, 42 feet beam, 27 feet depth and of 3,200 gross tons. Engines are of triple expansion type, with cylinders of 28, 44 and 73 inches diameter and 54 inches stroke. Steam at 190 pounds pressure will be supplied from four Scotch boilers, 14 feet 3 inches by 12½ feet. Each vessel will be fitted with a single screw, made of steel in one casting. The vessels have three decks and four watertight bulkheads. The upper deck is of steel, as is also the upper between decks. There are two steel pole masts, designed to carry fore and aft sails, and one funnel, oval in shape, and of a height of 80 feet from the grate bars. All modern improvements are provided, such as electric bells in each room and an electric fire alarm system. The steamers are designed to accommodate 120 first-class passengers, and cost $375,000 each. The equipment of the Hamilton and Jefferson includes Morison furnaces, and steam windlasses and capstans manufactured by the American Ship Windlass Co. of Providence, R. I.

A vessel now nearing completion at the Roach yard is the Atlas, an oil tank steamer building for the shipping and lighterage department of the Standard Oil Co., of which Mr. C. R. Veit, 26 Broadway, New York, is manager. She is 264 feet over all, 254 feet keel, 40 feet beam and 23½ feet depth, and is valued at $225,000. Machinery will be located in the center of the ship and will consist of triple expansion engines, with cylinders 21, 34 and 56 inches by 42 inches stroke. Steam will be supplied by two Scotch boilers, 14 feet 6 inches in diameter by 12 feet 9 inches in length, with three corrugated furnaces and a working pressure of 175 pounds. A surface condenser and independent air, circulating and feed pumps will be features of the vessel. There are also steam windlass, steam capstan and steam towing machine, the latter for 2-inch diameter steel hawser, all manufactured by the American Ship Windlass Co. of Providence, R. I., and Baldt stockless anchors. The Atlas, which will cost in the neighborhood of $225,000, is expected to carry 720,000 gallons of oil in bulk. She will have a speed of 8 knots.

SPARROW'S POINT SHIP YARD.

THOROUGHLY MODERN PLANT RECENTLY REOPENED BY THE MARYLAND STEEL CO.—NAVAL AND MERCANTILE CONTRACTS ON HAND.

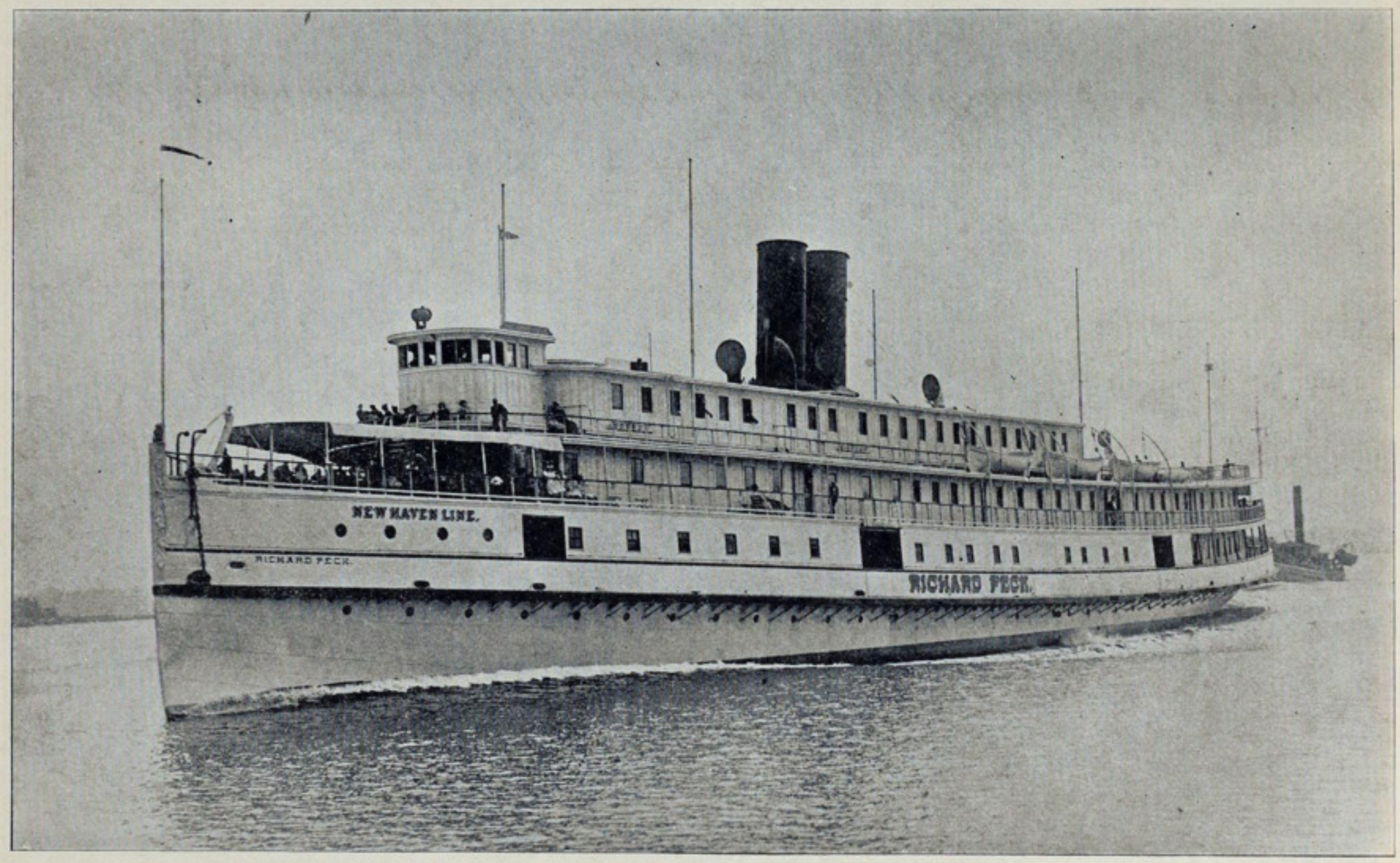
Sparrow's Point, Md., Jan. 6.—The visitor at the works of the Maryland Steel Co. at this place is most forcibly reminded of the change that has come over the ship building industry of the Atlantic coast since the war. Four years ago the ship building department of this big establishment, which is well known throughout the country on account of extensive operations in all branches of the steel industry, was closed, and the plant given over to bridge and structural work. Quite a large number of vessels had been built here—for the coasting trade, for river service, etc. —notably the Gloucester, a 2,500 ton freight and passenger steamer of the Merchants & Miners line, trading between Boston and Baltimore. But there were more shipyards than the demands of our limited commerce in American bottoms, especially in the foreign trade, would warrant, and as naval work was also very limited, the management of the Maryland company found it to their advantage to direct attention to other lines.

Upon the breaking out of the hostilities with Spain the situation was changed. A large fleet of merchant vessels was taken into the United States auxiliary navy, congress appropriated big sums of money for new naval vessels, and added to this was an unusual demand for new vessels for the coasting trade. The Maryland company was in position to take advantage of this changed condition of affairs. That part of their organization which pertains to shipbuilding had been greatly disturbed, but they had a plant that would not require much of an expenditure to make it one of the finest in the country. They submitted a bid to the government on the torpedo boat destroyers, for which orders were recently placed, and secured three of them. These vessels, to be known as the Truxtun, Whipple and Worden, were fully described in these columns when the plans of the torpedo boats were first given out by the navy department. But this government order is only a part of the work now in sight at the ship yard here. Contracts have been closed with the New Haven Steamboat Co. of New Haven, Conn., for a twin-screw freight and passenger steamer for Long Island sound service between New York and New Haven; and with the Baker-Whiteley Coal Co. of Baltimore, for a large ocean-going tug that will be modern in every way. These orders mean steady work for the ship yard for at least one year. The torpedo boat destroyers are to be completed within eighteen months from the date of signing contracts.

The claim that this ship yard, in connection with the steel works, possesses many points of great advantage, is well founded.

The location is admirable—a point of land washed on three sides by arms of the Chesapeake. The water frontage of the ship building department is about 950 feet, with a depth of 40 feet in some places and an average of 24 feet. There are four building ways with ample room for more, and a great length of wharf for fitting out of vessels after launching or for repair work on vessels. The construction of a dry dock has also been under consideration for some time past, and plans in this regard will undoubtedly be hurried, now that the amount of new work on hand is so large. Boiler and machine shops have travelling cranes electrically driven, and tools are nearly all of a modern kind, but as a result of the several orders for new ships, improvements have been and are being made in this regard. These improvements include the use of electric motors for driving machine tools, and the adoption also of compressed air and hydraulic machinery. In one of the several views presented in a supplement to this issue, the large ship yard shears, operated by hydraulic power, is illustrated in the act of lifting a 130-ton Krupp gun. A complete wood-working plant, with Sturtevant dryer and large supplies of well-seasoned lumber in sheds, is also a feature of the marine department.

In all its parts the Maryland company's establishment covers an area of 1,000 acres. A system of railroad tracks thirty miles in length extends over the different departments and connects with the Baltimore & Ohio and the Pennsylvania systems. From the rail mills and other departments the freight, when the plant is in full operation, averages about 2,000 tons a day. The works at Sparrow's Point, together with the furnace and mills at Steelton, Pa., will provide practically everything entering into the construction of a ship, from the plates and shapes to the tubes for water-tube boilers. The operations of the company extend even further than this, as a very large part of their ore supply comes from their own iron mines in Cuba. The company owns about 600 dwelling houses, all neat and comfortable, and some very expensively built. Sparrow's Point (the name of this Eastern Pullman) has electric lights, macadamized streets, artesian wells, free mail delivery, free schools and kindergarten, churches, public halls, and absolute prohibition. The 2,500 men employed by the company, with their families, live at Sparrow's Point, safe from the intrusion of the undesirable element in the labor line. These works are ably managed by Mr. F. W. Wood, who has been president of the company since the establishment at Sparrow's Point was built. Mr. A. G. Wilson, who a few months ago took the management of the marine department, spent thirty-six years with the Harlan & Hollingsworth Co. of Wilmington, Del., in various capacities.



The Richard Peck—Duplicate of the Steamer Building by the Maryland Steel Co., Sparrow's Point, Md., for the New York & New Haven Steamboat Co.

It will be of interest in connection with the description of this ship yard to give a few particulars of the two new vessels, other than the torpedo boat destroyers, for which orders have been taken recently. Messrs. Cary Smith & Barbey, naval architects of New York, are the designers of the passenger and freight steamer to be built for Long Island sound service between New York and New Haven. This steamer will be practically a duplicate of the Richard Peck (also designed by Mr. A. Cary Smith for the sound service, and built by the Harlan & Hollingsworth Co. of Wilmington, Del., in 1892), the hull being 10 feet longer and the power greater. The passenger accommodations will also be increased by the addition of a gallery saloon aft. Greater speed is expected, as the design is considered an improvement over that of the Peck. The dimensions of the new steamer will be 325 feet over all, beam molded 48 feet, over guards 65 feet, molded depth 17 feet 9 inches. Her engines (two triple expansion) will have cylinders of 24, 38 and 60 inches diameter with 30-inch stroke, and steam will be supplied at 170 pounds working pressure from six cylindrical tubular boilers.

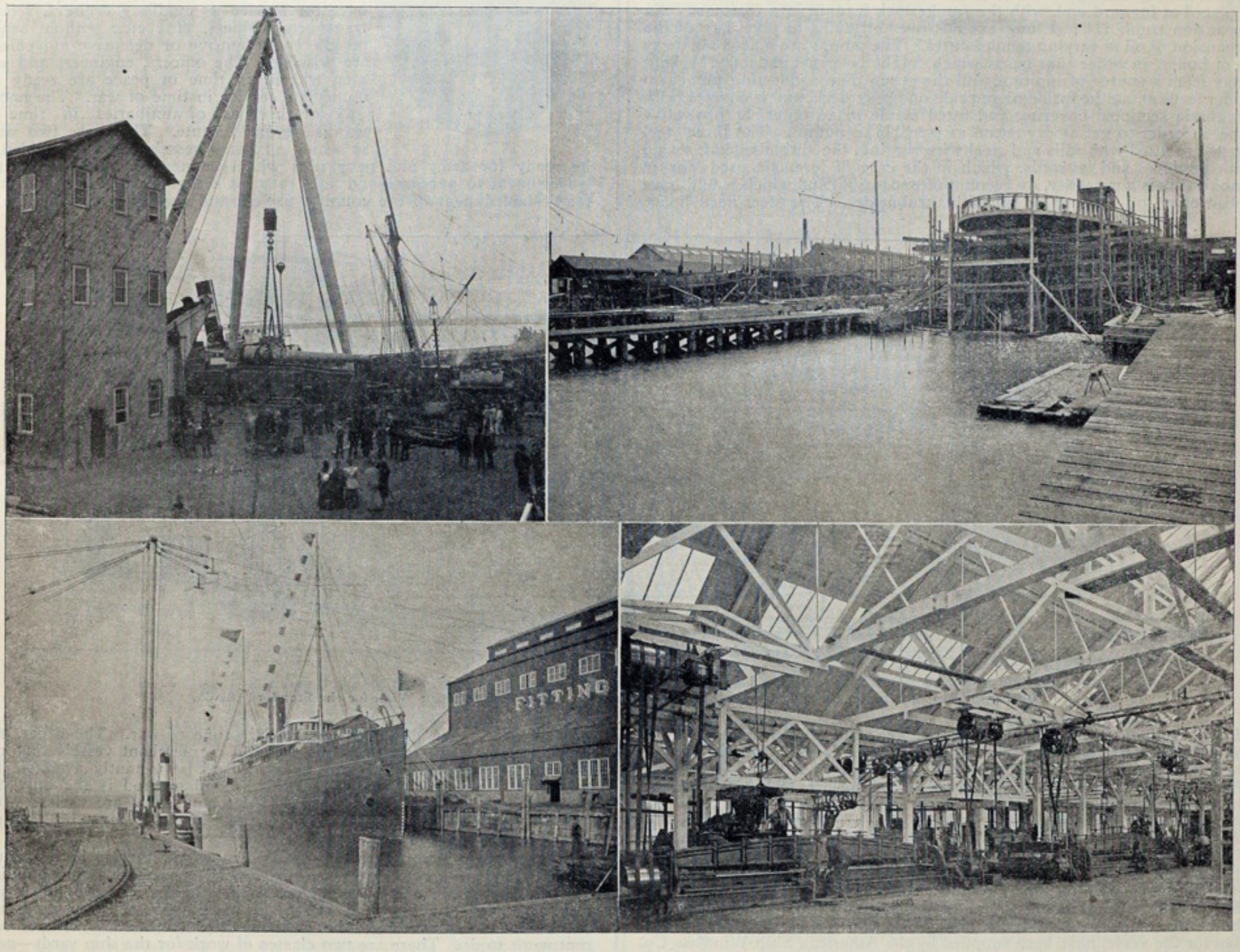
The sea-going tug for the Baker-Whiteley Coal Co. will be constructed under the direction of Mr. F. B. King, naval architect of Washington, D. C., and will be a steel vessel, 112½ feet in length between perpendiculars, 125 feet over all, 24½ feet molded breadth, and 14 feet depth. The deck house will be of steel with interior finish of hardwood. Engines will be triple expansion, with cylinders of 12½, 23½ and 39 inches diameter by 28-inch stroke. Steam will be furnished at 175 pounds working pressure, and it is expected the engines will develop 750 to 800 horse power. Powerful fire and wrecking pumps, as well as steam steering gear, steam capstan and an electric light plant, will be included in the equipment.

SHIP BUILDING IN CANADA.

BIG THINGS EXPECTED WHEN THE ST. LAWRENCE CANALS ARE COMPLETED—TORONTO HAS FIRST CALL IN THE INDUSTRY.

Toronto, Ont., Jan. 10—Vessel men in the states who are figuring on steam vessels of Welland canal dimensions, to run through from the upper lakes to Montreal and Quebec when the St. Lawrence canal improvements are completed, will probably find that after spending millions on these canals, Canada will not neglect her own shipping interests. Some plan will undoubtedly be found to encourage the building of vessels in Canada for this trade. In Buffalo and other places that derive great advantage from the grain trade of the lakes, it is said that Canada has been too long at work on her canals; that the locks planned years ago are too small to admit of the passage of vessels capable of competing with the 8,000-ton modern ships that transfer grain for the seaboard to railways at Buffalo, and that the Canadian canal improvements have been so long delayed as to defeat the end for which they were intended. But as against this argument there is the one important advantage of vessels of about 2,500 tons capacity on canal draft carrying grain without breaking of bulk, all the way from the head of Lake Superior through to Montreal or Quebec for direct transfer to transatlantic ships. Sir Wilfred Laurier says this will occur in September of the present year, the time fixed by the government for the completion of the canal work. Probably it will be the spring of 1900, instead of September of this year, but in any event the vessel interests of Canada are expecting that when this great work is at an end they will secure such assistance from the government as will enable them to at least hold for Canadian ships the growing export trade in grain from Manitoba. It is, in fact, hinted in government circles that this will be done, even though most liberal legislation may be required to encourage ship building.

Toronto has the start in a ship building way and will undoubtedly derive most advantage from the improved conditions that are expected to follow the completion of the canal work. The plant of the Bertram Engine Works Co., partly destroyed by fire some time ago, is being rebuilt on a more extensive scale, and is prepared to undertake a very large amount of new ship building. Just now there are only two small steel vessels under order at these works, a tug and pleasure craft, but it is understood they have in view at least two more tugs, each of about 100 feet length, and a freight carrier or two, in addition to more new passenger steamers for the Richelieu & Ontario Navigation Co. The Richelieu & Ontario company must have more passenger steamers, but they have a difficult problem on hand in deciding what kind of vessels to build. The new steamer Toronto, built by the Bertram company and to go into commission on Lake Ontario next summer, is one of the finest vessels of her kind on the lakes. It will be remembered that it was the intention to build a second Toronto. The only reason why this second steamer is not built at once is the evident inability of the present vessels in the trade down the St. Lawrence to care for the business that would be presented to them. Two or three shallow-draft vessels of the best modern type that can be provided for the river service are required and must be built. This work will undoubtedly come to Toronto. It will thus be seen that although there is not, just now, a great deal in the way of new ships in hand here, the industry will undoubtedly assume important proportions before many months have passed, in view of the demands of the passenger trade and the prospects of encouragement from the government for Canadian freight carriers when the canal improvements are completed.



Scenes at the Recently Reopened Ship Yard of the Maryland Steel Co., Sparrow's Point, Md.

PNEUMATIC TOOLS IN SHIP YARDS.

The development of the metal-working tool industry in the United States during the past few years has been wonderful. Probably in no line is this progress more marked than in pneumatic tools. Referring to the business of his company during the past year, Mr. Chas. Booth, manager of the Chicago Pneumatic Tool Co. says: "We had a rapid increase in our business from month to month during the past year, and 1899 opens with promises of still further increase. Our business for December, 1898, was probably four times as great as for the corresponding month of 1897, and the business of the year as a whole has been of a most gratifying order. The use of pneumatic tools is expanding in different directions all the time, while the demand for the tools among those already using them is constantly on the increase. In manufacturing concerns generally, and in railroad shops and ship yards in particular, it is no longer a question of whether the use of pneumatic tools can be afforded, but rather that they cannot afford to be without them. This fact is so well recognized by the United States navy department that we have been recently awarded contracts for equipping the principal navy yards of the country.

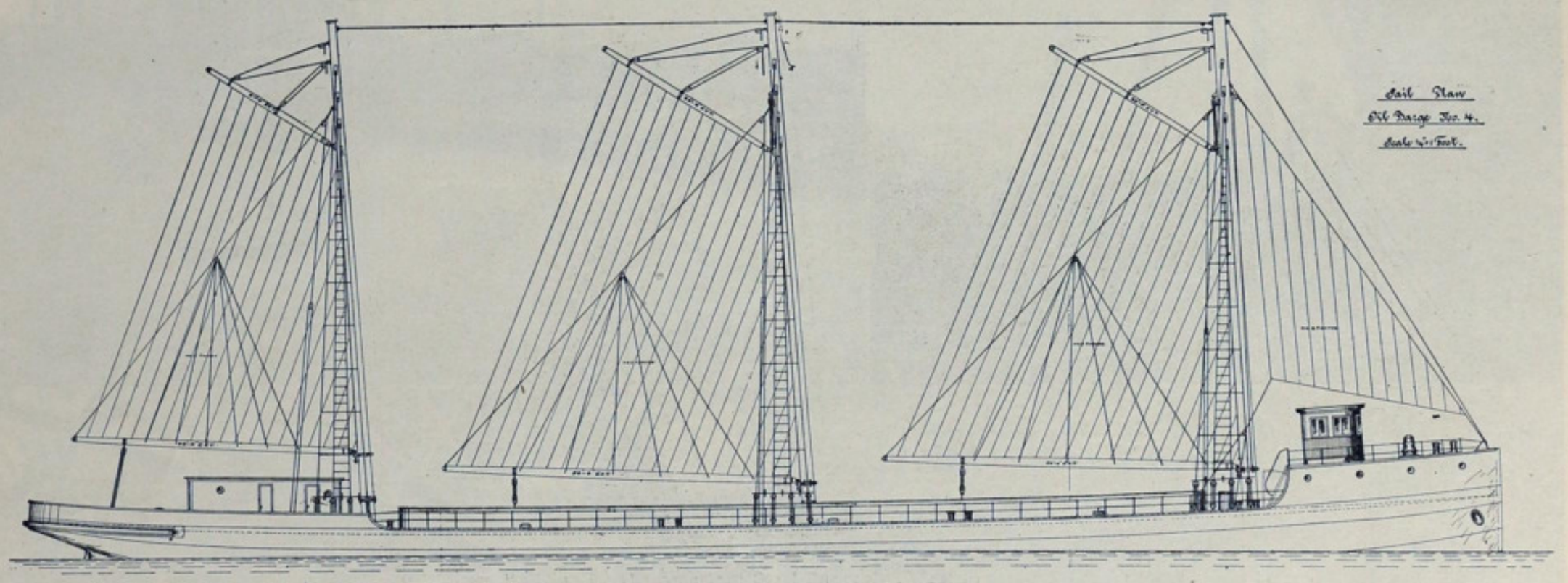
"The new tools we are constantly bringing out have met with great favor among all users, and the demand has every indication of being a permanent one. The Boyer riveters, hammers and drills, which are everywere acknowledged to be the standard of excellence, are in use all over the civilized world, as well as in all the railroad shops and other large plants in this country. Our new hand riveters for ship builders, bridge and structural work have proved to be an even greater success than anticipated. In foreign countries our trade is rapidly growing also, and our president, Mr. J. W. Duntley, who is now in Europe, reports an excellent prospect for doubling the business next year. Our tools have been adopted as standard in several of the important ship building yards along the Clyde, and in many of the more extensive establishments in England and on the continent."

STANDARD OIL BARGE.

NUMEROUS IMPROVEMENTS FOR THIS TYPE OF CRAFT EMBODIED IN THE VESSEL NOW UNDER CONSTRUCTION BY THE AMERICAN STEEL BARGE CO., WEST SUPERIOR, WIS.

The sale or charter by the Standard Oil Co. to the government during the recent war of several oil barges and tank steamers, and their use for supplying the vessels of the West Indian fleet with fresh water, has attracted considerable attention to this class of craft. Of an essentially interesting type of construction, it has been developed with surprising rapidity, and still further improvements may be expected in the vessel most recently contracted for.

The accompanying cuts illustrate the Standard oil barge now in course of construction at the American Steel Barge Co.'s works, West Superior, Wis. The vessel is 210 feet over all, 200 feet keel, 38 feet beam and 17 feet moulded depth. She is to have a capacity of about 632,000 gallons of oil on a draft of 14 feet, even keel. She is constructed of steel, of 60,000 to 70,000 pounds tensile strength, with an extension of 20 per cent in eight inches. The vessel will have no center line bulkhead, but will be divided 'thwartships into six tanks, having a cofferdam for water at forward end to prevent any leakage of oil or gases from getting to boiler. The boiler is placed at forward end, with the smokestack leading into foremast. An expansion trunk 114 feet long extends over oil tanks to take care of the expansion of oil at varying temperatures. The pumps are placed aft, away from boiler, in order that gases which might be generated may be kept away from a source of ignition, and the steam pipe connecting pumps to boiler leads along the inside of gunwale on upper deck, and is covered with Magnesia sectional covering and fitted inside of an outer, or protective pipe, in order to get as dry steam as possible to pumps. The three steel masts are fitted with sails and steel wire rigging, the shrouds being set up with deadeyes and lanyards, which in the case of foremast used for a smokestack is a necessity, on account of expansion, and which would have a bad effect on rigging set up with turnbuckles. The steel deck house aft will contain accommodations for captain, mate, steward and crew, together with mess room and kitchen and entrance to pump room. This is the fourth vessel of this type built by the American Steel Barge Co. for the Standard Oil Co., the three former vessels having been constructed under the inspection and supervision of D. E. Ford, then representing the Standard company as inspector, while in this latter case Mr. Ford is the constructor himself, as superintendent of the American Steel Barge Co. The placing of this contract at West Superior without competitive bids, speaks well for the confidence which the owners have in the American Steel Barge Co. and its superintendent, and it is safe to predict that when the vessel goes into commission, another success will have been added to the barge company's already long list. A steam windlass and steam capstan for the vessel have been supplied by the American Ship Windlass Co. of Providence, R. I.



Outboard Plan, Oil Barge, Building by the American Steel Barge Co., West Superior Wis., for the Standard Oil Co.

CHALLENGER FOR THE CANADA'S CUP.

Chicago, Ill., Jan. 11—On a small island in the Calumet river just west of 92nd street bridge, and about a quarter of a mile from the mouth of the river, Chicago is soon to have a boat building establishment that will very probably turn out pleasure craft of a creditable kind. A. G. Cuthbert, who has a contract from gentlemen of the Chicago Yacht Club to design and build the challenger for the Canada's cup, has for some time past been planning the arrangement of this boat works. Yachts built by Mr. Cuthbert are well known on the lower lakes and rivers, as are also those of his father, which held records for thirty years previously. He has leased a piece of property, 300 by 400 feet, at the point referred to, and intends to put up buildings and machinery necessary for a modern plant to build composite and wooden boats of all kinds.

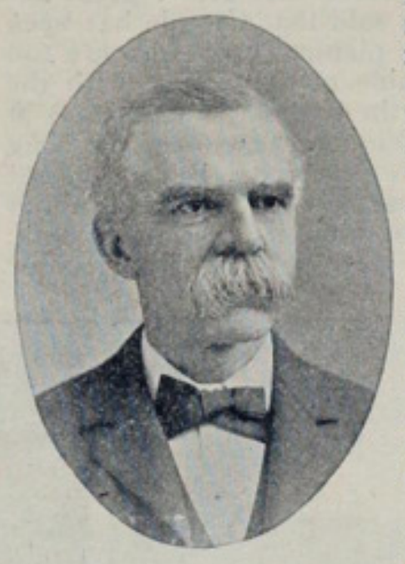
Work has been started on the buildings, the first being a frame structure 28 by 100 feet, one half of which will be closed off to build the Challenger. Designs of this yacht will, of course, be kept secret until the day of her launching, and absolutely nothing can be learned about her. Mr. Cuthbert has beside two other contracts, one for a cutter racing yacht and another for a launch. He also has other work in view, which he hopes to secure shortly. As soon as business warrants it, he will put in considerable machinery and erect larger buildings, and in the spring will put down a first-class marine railway, capable of hauling out boats up to 12 feet draught.

OUR FOREIGN MERCHANT MARINE.

ABLE DISCUSSION OF WHAT IS NOW ONE OF THE GREATEST OF NATIONAL QUESTIONS—A FEW PARAGRAPHS FULL OF PRACTICAL ARGUMENT ON THE SHIPPING SUBJECT.

BY FRANK. J. FIRTH, PHILADELPHIA.

The United States needs a merchant marine on the oceans, built in our own ship yards, officered by our own citizens and carrying the products of our farms, mines, forests and factories under our own flag to all the markets of the world. In time of peace such a merchant marine gives employment to our ship yards; it provides useful service for our idle capital; it keeps in our own country the hundreds of millions we now pay to foreigners annually for ocean freight on our surplus products; it advertises our nation in the markets of the world as nothing else can do so well; it trains an army of officers, engineers and seamen for the national defense.



In time of war such a merchant marine is invaluable. The vessels become available at once for service as auxiliary cruisers, scouts, transports, colliers, etc., etc., without which no effective offensive or defensive movements are possible. The officers, engineers and seamen trained in time of peace are ready for immediate service in time of war. The necessity for this class of auxiliaries in time of war is beyond dispute. There are two ways in which auxiliary vessels can be provided to be ready for army and navy uses whenever needed. One is for the government to purchase and hold them as a part of the naval and military establishment of the country, useless and expensive to maintain in time of peace, but absolutely essential in time of war. The other, and sensible, way is to encourage the creation of merchant vessels that can find useful employment in time of peace and be instantly available for government use in time of war. This second method is the only one that provides trained men as well as ships, and ships are useless without trained men. One or the other of these methods must be adopted. Can there be any doubt as to which is the best?

The United States not only needs a merchant marine both in time of peace and in time of war, but it also needs prosperous ship building industries so that it may have citizens capable of designing, building and repairing when necessary all classes of naval vessels. Ship yards are necessities in any stable government and they cannot exist without current work to do. There are two classes of work for the ship yards—government work and private work—naval vessels of our own and other nations and the merchant marine. If nothing better could be done the United States would be obliged to sustain its ship yards by keeping them supplied with naval work. Any other course than one sustaining our ship building industries would be suicidal and would place us at the mercy of any second rate power in time of war. Instead of building naval vessels in excess of our needs, it is certainly far better to so legislate that our ship yards shall have merchant vessels of the United States to build and keep in repair. We cannot successfully defend ourselves against aggression without ship yards capable of creating and maintaining naval vessels of the highest class. It is not a matter of indifference to us as a nation whether our naval or merchant vessels are built in our own country or in foreign ship yards. Legislation that insures the building of our ships in our own yards is intelligent legislation and has in view the best interest of the entire nation. Legislation that ignores a national interest in the success of our ship yards and professes it is a matter of no importance where our merchant ships are built, so that we get them where they can be bought the cheapest, is unintelligent and narrow legislation.

It is not a political question involving the merits of any party policy of free trade or protection. It is a great national question rising far above all party policies, and demanding such a grand and patriotic response from the entire American people as followed the recent declaration of war against Spain. At such a time, or in the presence of such a great question, there can be no north, south, east or west; there can

be no Republicans, Democrats or Populists. Broad as is our country it has, at such a time, no standing room for any class of people other than patriotic Americans. The determination of a national policy under which our ship building industries and our merchant marine may be created and sustained has direct relation to a necessary state of preparedness to resist any attack that may be made upon us. The preparation for national defense is as truly a patriotic and non-partisan work as is the defense of the nation when a state of war actually exists. Let us all, therefore, legislators and people, recognize the character of the great question with which we have to deal, and let us strive to clearly comprehend the absolute need, in preparing for the defense of our national honor whenever and however it may be assailed, for the existence of a vigorous merchant marine on the oceans and of prosperous ship building industries to create and maintain such a marine.

When we secure the vessels there still remains the question as to their profitable employment, and here we meet with a practical question demanding the highest order of statesmanship on the part of our national legislators. The law of competition is well understood and of universal application. It is the law of the survival of the fittest when pursued to its natural and ultimate result. If the American people want a merchant marine upon the oceans they must see to it, as a nation needing such a marine, that the conditions are created and continued essential to success. We may be violently, and justly, opposed on theory to subsidies, bounties or any aid by the nation to its merchant marine, but while we theorize our foreign rivals absorb our trade and our merchant marine passes out of existence. If this is a matter of indifference to us as a people then there is nothing more to say about it, but if, on the contrary, we see that the extension of our foreign markets and, above all, our preparation for national defense, demand the existence of a merchant marine, then as a practical people we will relegate our theories to the back ground and we will deal with conditions as we find them. We will say that we are strong enough and rich enough as a nation to have what we want, and that wanting a merchant marine we intend to have it. We well know from the alarming decline in our shipping that has taken place during the last thirty or forty years, and from the absolute impossibility of inducing American capital to invest in ocean vessels under existing conditions that there is something to be looked after. Under liberal policies in the matter of bounties, subsidies or compensation under some other name or designation, our foreign rivals have encouraged their people to take possession of the oceans, until today a ship bearing the American flag is a curiosity upon the oceans and in the foreign markets of the world. There are just two courses open to us as a nation. One is to allow matters to take care of themselves, as we have done for many years past, and if our flag and our merchant vessels disappear entirely from the oceans, let them go. The other course is to claim and take that share of the ocean carrying trade which is our just due, and submit to any sacrifice of theories, however hallowed they may be by old association, that may result. Shall we be driven from the oceans and depend entirely upon foreign nations to carry our products to market, making no provision for the ships or men we will need, either in our foreign trade or for the national defense in time of war? Or shall we enter upon an aggressive campaign to recover some of our lost ground, building in American ship yards and sustaining an American merchant marine upon the oceans that will carry our flag with honor to all the ports of the world and meet all calls upon it, whether for peace or war? Which shall be the policy of the nation? Make your will known to your representatives in your national legislature.

Only a few years ago manufacturers of tools gave little attention to advertising further than the publication of catalogues. Now they are all studying advertising methods, and their expenditures in this line are carefully placed. The Standard Tool Co. of Cleveland, recently issued a calendar—not of the stock kind, but one that contains catalogue features and handy tables that will result in its being preserved by users of tools made by the Standard company.

The firm of William H. Birch & Co. of 129-135 First street, San Francisco, is busy on the Nunivak, which they are constructing for the United States government.

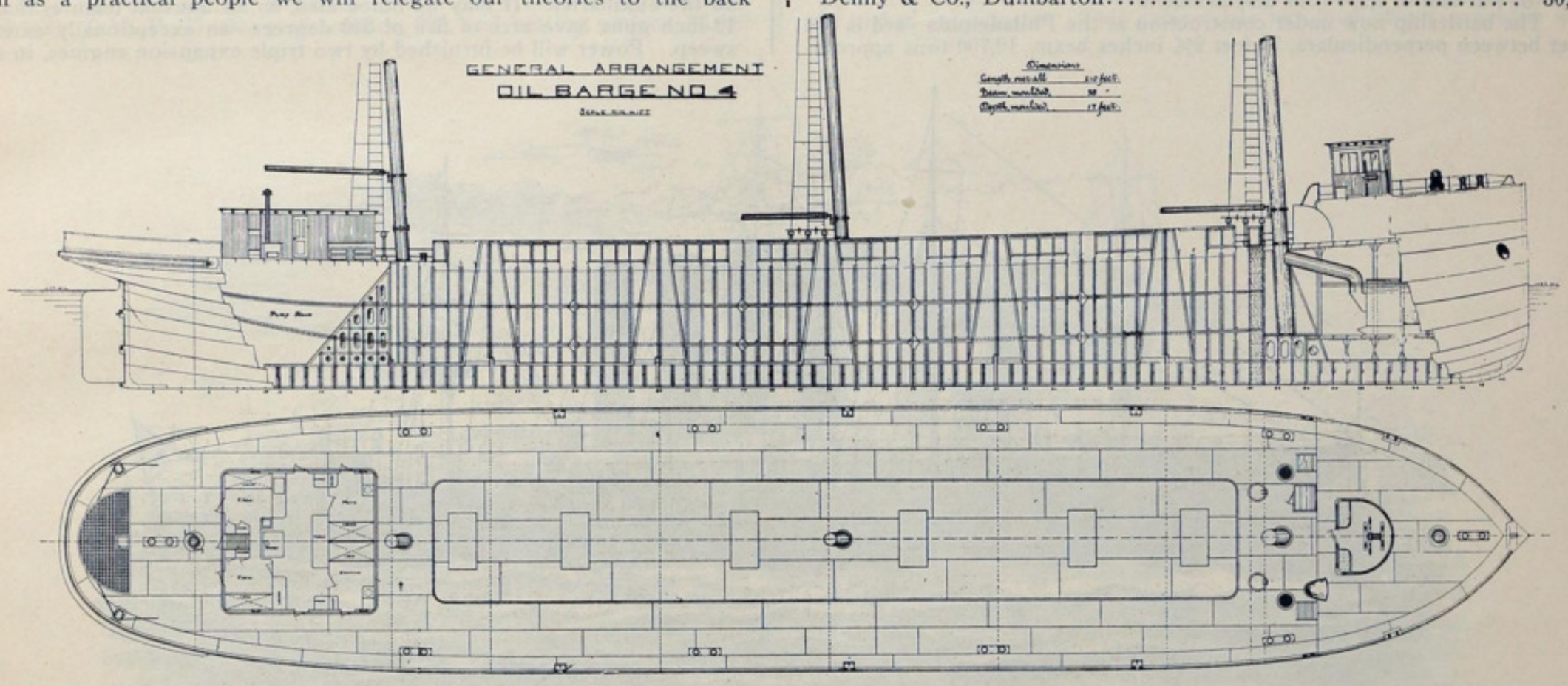
SHIP BUILDING IN THE UNITED KINGDOM.

Ship building returns for Great Britain and Ireland, which have just been compiled for the year 1898, evidence the correctness of the anticipation that the aggregate for the year would exceed the showing for any previous similar period. Following is a summary of launches from private yards for 1898, as compared with previous years:

Launched in 1898, 923 vessels of 1,581,998 tons; in 1897, 635 vessels of 1,016,066 tons; in 1896, 743 vessels of 1,257,339 tons; in 1895, 630 vessels of 1,028,708 tons; in 1894, 637 vessels of 1,052,779 tons; in 1893, 545 vessels of 849,881 tons in 1892, 702 vessels of 1,210,657 tons. In addition to the above nine war ships were launched from the government dock yards, the six previous years totals being also given: 1898, 9 war ships of 73,090 tons displacement; 1897, 4 warships, 31,885 tons; 1896, 9 war ships, 71,970 tons; 1895, 8 war ships, 70,350 tons; 1894, 8 war ships, 26,700 tons; 1893, 9 war ships, 32,400 tons; 1892, 9 war ships, 60,450 tons.

Following is a list of the marine engineering firms whose output for the year exceeded 30.000 indicated horse power:

	HORSE POWER.
R. & W. Hawthorn, Leslie & Co., Newcastle	75,400
Fairfield Ship Building Co. Govan	74,300
Clydebank Engineering Co	72,300
Wallsend Slipway Co	68,110
Farle's Ship Building Co., Hull	48,550
Central Marine Engine Works, West Hartlepool	47,300
North-Eastern Marine Engineering Co	40,375
Vickers, Sons & Maxim, Barrow	35,700
Harland & Wolff, Belfast	33,350
Workman, Clark & Co., Belfast	32,520
Sir C. Furness, Westgarth & Co	32,172
Denny & Co., Dumbarton	30,120



Inboard and Deck Plans of the Oil Barge now under Construction at the Yard of the American Steel Barge Co., West Superior, Wis.

ANOTHER CONTRACT FOR THE ROACH YARD.

A contract was closed by the Roach company a few days ago with John Englis of New York for a steel passenger and freight steamer for the New England coast service. She will be 320 feet over all, 300 feet between perpendiculars, 50 feet molded beam, 62 feet over guards and 20 feet depth. This vessel will carry 500 tons of freight and 100 tons of coal on a draught of 14 feet, and make 16 miles. There will be accommodations for 400 passengers, there being over 200 separate staterooms. A triple expansion engine developing 2,500 horse power will drive a steel propeller 14 feet 6 inches in diameter. Steam will be supplied by six Scotch boilers, working at a pressure of 170 pounds. The contract calls for the completion of the vessel by Oct. 1, 1899.

The record of the Roach yard has been a remarkable one. It has built since its establishment in 1872 a total of about 140 merchant vessels, of an aggregate of 260,000 tons, and ten naval vessels aggregating 19,618 tons, a total of 150 vessels with a tonnage approaching 280,000. John B. Roach, the president, was born in New York City in 1839, went to Chester in 1871, and after the death of his father in 1887 was elected to the presidency. The credit for the capable management of the yard is shared by Mr. Roach's energetic co-worker, Mr. W. C. Sproul, vice-president of the company.

The Rescue, the largest wrecking tug in the world, building for the Merritt-Chapman Wrecking Co. of New York, was launched recently at Brown's ship yard, Tottenville, S. I., N. Y. She is 170 feet long, 31 feet beam, 17 depth of hold, and fitted with triple expansion engines developing 1,400 horse power. The vessel, which will cost when completed $100,000, will be fitted with the latest wrecking apparatus, including a fine equipment of Blake pumps.

A large portion of the workmen at the Harlan & Hollingsworth Co.'s yard, Wilmington, Del., are now working overtime, and it is quite possible that a regular arrangement will ere long be entered into to operate the plant day and night.

A recent report is to the effect that the Maryland Steel Co., Sparrow's Point, Md., is preparing estimates for a 400-foot steamer for the Plant line, for service between Tampa and West Indian ports.

AT CRAMPS' SHIP YARD.

THE BATTLESHIP AND ARMORED CRUISER BUILDING BY THE PHILADELPHIA FIRM FOR THE RUSSIAN GOVERNMENT—FIRSTCLASS SHIPS—FOREIGN ORDERS FOR VESSELS OF WAR.

Although both the William Cramp & Sons Ship & Engine Building Co. of Philadelphia and the Union Iron Works of San Francisco were engaged at the time upon contracts for war vessels for the Imperial Japanese navy, considerable significance was attached to the award to the Cramps last year of a contract for two first class vessels—a battleship and a cruiser—by the Russian government. Possibly this was due not so much to the fact of it being a foreign order as from the circumstance that it came from a power, which, although building practically all her war vessels away from home, had not been a patron of American yards during the almost twenty years that had intervened since the Cramps executed the commission for two ships for the czar's government, this order constituting the first contract from Europe that ever came to an American builder for war vessels. Moreover, it was a compliment to the Philadelphia concern that when it was decided to place a second order in America, the degree of efficiency demonstrated during the nineteen years of trial with the old boats was the strongest kind of an argument in favor of the Cramps.

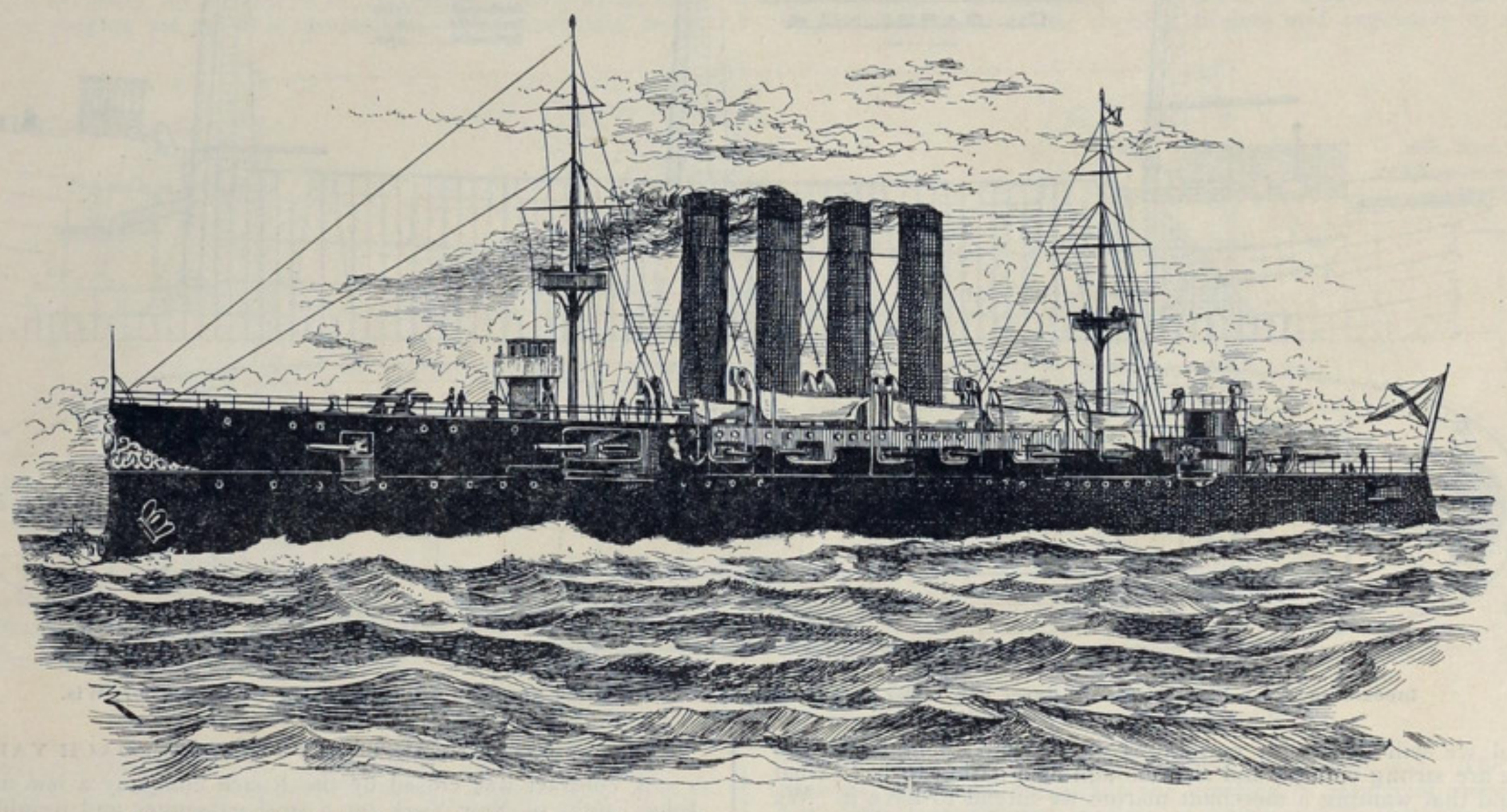
The first foreign order that came to the Cramp company was that for the Liberatador, a Venezuelan gun boat of 355 tons, which was built in 1859. Then in 1879 came an order from the Russian government to convert the merchant ships Asia, Africa and Europe, of 2,490, 2,852 and 3,170 tons displacement respectively, into cruisers, and this was followed in 1880 by a contract for the construction of the cruiser Zabiaca, designed as a man-of-war and of 1,230 tons displacement.

The battleship now under construction at the Philadelphia yard is 376 feet between perpendiculars, 72 feet 2½ inches beam, 12,700 tons approximate displacement, 26 feet draught, and 18 knots speed, the contract calling for the maintenance of this speed at full displacement for 12 hours. The vessel is in design a combination of the best features of a battleship and a cruiser. Her size, armor and armament entitles her to rank as a first class battleship, while her speed, coal capacity and wide steaming radius will enable her to compete with almost any of the ordinary type of cruisers.

In these vessels the Russian naval architects have evidenced a disposition to continue their long time adherence to the French idea of a continuous belt of side armor. The belt on the battleship will extend for two-thirds the length of the vessel and will have a thickness of 9 inches to the level of the protective deck. The latter will have a thickness of 2 inches on the flat and 4 inches on the slopes. The slopes start on a level with the top of the 9 inch belt and descend below the water line, where they join the bottom of the belt. The coal bunkers occupy the space between the slope and the belt, the engines and boilers being thus protected by 9 inches of Krupp steel, from 6 to 10 tons of coal and 4 inches of sloping Krupp armor. If it be estimated that the coal would be equal in resistance power to 3 inches of steel and that the 4 inch slope corresponds to 6 inches of vertical steel, it may be readily computed that the total resistance offered to a projectile would be equal to that afforded by vertical armor of 18 inches thickness. The protective deck extends the full length of the vessel, curving down to meet the stem and stern. It is merged, at the stem, into the framing of the ram bow, and serves to both stiffen the ram and transmit the shock of impact to the whole structure of the ship. Amidships, above the 9-inch belt and between the protective and gun decks, will be located another 6-inch armored belt, designed to prevent rapid-fire shells from penetrating and bursting beneath the guns on the deck above.

The greater part of the rapid-fire armament will be carried on the gun deck. Amidships above the 6-inch belt will be located, in broadside, a battery of eight 6-inch rapid fire guns, with a considerable train both forward and aft. These guns are fired through casements, protected by steel five inches in thickness, and complete athwartship walls of armor afford protection against a raking fire. The 9-inch belts are also continued athwart the ship, to form bulkheads in order to protect the engine and boiler rooms. Eight 3-inch rapid firers are located forward of the central battery on the main deck and four guns of the same calibre are located aft of the battery. Except where occupied by the amidship superstructure, the main deck is flush throughout the ship. Located forward and aft of the superstructure mentioned are two elliptical turrets, each of which will contain two high-powered 12-inch rifles. At each of the four angles within the superstructure will be a six-inch gun, protected by Krupp armor and possessing a wide range of fire from dead ahead to well abaft the beam. Between these on each broadside will be six 3-inch rapid firers. In addition to all those enumerated, there will be 34 additional guns of 3-inch calibre or less, which will be located on the boat deck, the bridge and in the fighting tops. Mounted amidships on the boat deck are two 3-inch guns, one at each broadside; six 1⅞-inch rapid firers are located forward on this deck and an equal number aft, while twelve are stationed on the bridges. Two 2½-inch rapid firers have been advantageously placed, while the fighting tops will be equipped with six 1½-inch rapid firers. This means a total of over seventy rapid fire guns, and there are in addition six torpedo tubes. These tubes will be placed, one at the bow, one at the stern and two on each broadside, the latter being of the under-water type.

It is worthy of note that in this steel, unsheathed vessel there will be a double bottom ranging fore and aft for the greater part of her length and extending from the keel up to the lower edge of the water-line belt of heavy armor. There is nothing that might be classed as internal-structural peculiarities, with the possible exception of the double bottom provision for liquid fuel and feed water supply. The ammunition hoists and the turrets will be electrically worked, and in fact electricity will be applied to all the auxiliaries. It may be noted also, as an unusual feature, that the 12-inch guns have arcs of fire of 340 degrees—an exceptionally extended sweep. Power will be furnished by two triple expansion engines, in separate watertight compartments, working twin screws, and when making 126 revolutions per minute will develop 16,000 indicated horse power and induce a speed of fully 18 knots. This battleship will be the first built in this country to have a complete installation of water tube boilers and machinery particularly adapted to boilers of this type. The twenty-four Niclausse boilers with which she will be supplied will be arranged in four separate fire rooms and are built for a working pressure of 250 pounds. The bunker capacity will be 2,000 tons.



The 6,500-ton Armored Cruiser Building for the Russian Government by the Wm. Cramp & Sons Ship & Engine Building Co.

The vessel will be supplied, of course, with every known modern improvement, and will be lighted throughout with electricity, as will also the cruiser to be hereafter described, each having six large search lights, four on the bridges and two in the fighting tops. The battleship's conning tower of heavy forged steel will be forward, immediately below the chart house. In addition to the row boats on the bridge deck, the vessel will carry two large steam cutters and two second class torpedo boats, which will be placed on skids above the 'midship main-deck battery. Three powerful boom cranes of steel will be provided to handle these boats. The complement of the vessel will be in the neighborhood of 750 officers and men.

The cruiser, for which the keel was laid simultaneously with that of the battleship, and which will probably be completed some time before the other vessel, will be 400 feet between perpendiculars, 52 feet beam, 19 feet 6 inches draught, 6,500 tons displacement, 23 knots speed, and will carry as armament twelve 6-inch rapid-fire guns, twelve 3-inch rapid-fire guns, six 1⅞-inch rapid-firers and four torpedo tubes. She will, of course, have a double bottom, but as in the case of the battleship will be unsheathed. There will be a protective deck of 1½ inches extending from stem to stern, and on the slopes it will have a thickness of 3 inches. As in the case of the battleship, Niclausse water tube boilers will be installed and no less than thirty boilers of this type will be required to supply steam to the two triple expansion engines in separate water tight compartments, actuating twin screws, and which are expected to develop 20,000 indicated horse power and enable the maintenance of a speed of 23 knots for twelve hours

continuous steaming. The bunker capacity of the vessel will be 1,400 tons.

All the guns in the armament will be guarded by adequate shields. Of the main battery of 6-inch guns, eight will be mounted on the main deck, four in each 'midship battery, two on the forecastle and two on the poop deck. The two forward and two after guns amidship will be enabled to give a dead ahead and dead astern fire in conjunction with their broadside fire. As the guns on the forecastle and poop also have wide arcs of fire, a broadside of six guns can be brought to bear. The twelve 3-inch guns will be mounted on the main and berth decks, while the weapons of smaller calibre will be placed on the bridges and in the fighting tops. The cruiser will have a complement of 450 officers and men. The armament for both vessels will be made at the Obrehoff Works in Russia.

JAPANESE CRUISER CHITOSE.

THE UNION IRON WORKS, SAN FRANCISCO, HAS READY FOR TRIAL THE SECOND VESSEL CONSTRUCTED IN THE UNITED STATES FOR THE IMPERIAL JAPANESE NAVY.

Workmen at the plant of the Union Iron Works, San Francisco, are putting the finishing touches on the Japanese cruiser Chitose, the second of the two war vessels for which contracts were awarded to American builders by the Japanese government about two years ago. The other vessel was the cruiser Kasagi, recently delivered by the Cramps, and a complete description of which was published in the Review at the time of her trial. These two protected cruisers, although not sister ships, are very similar in design and identical in armament. The principal dimensions of the Kasagi built by Cramps are: Length between perpendiculars, 374.5 feet; beam, 48 feet 9 inches; mean draught, 17 feet 9 inches; displacement, 4,900 tons; I. H. P., 17,000; grate surface, 920, and heating surface, 26,000 square feet. Particulars of the Union Iron Works cruiser are: Length over all, 405 feet; length between perpendiculars, 376 feet; beam, 49 feet; mean draught, 17 feet 7.25 inches; displacement, 4,760 tons; I. H. P., 15,500; grate surface, 792, and heating surface, 22,000 square feet.

It will thus be seen that the Chitose, while of greater dimensions, is of less displacement, draught and horse power. Although sometimes classed as armored cruisers, these two vessels are in reality protected cruisers of the second class, and like all vessels of their class have no defensive armor, relying on coal bunkers, which run 108 feet fore and aft of the amidship section, to protect the engines, which are entirely below the water line. Above these there is a protective deck, having a maximum thickness of 4.5 inches on the slopes and 1.75 inches on the flat.

The contract for the Chitose was signed at Washington, D. C., Dec. 31, 1896. The first piece of keel was laid May 1, 1897. The first rivet was driven June 26, 1897, and the vessel was launched Jan. 22, 1898. It is expected that she will be ready for her trial some time this month (January, 1899). Principal dimensions and other particulars of the vessel are as follows:

Length over all, feet and inches	405-2
Length, loadwater line, feet and inches	396-0
Length, between perpendiculars, feet and inches	376-5
Breadth, moulded, feet and inches	49-0
Draught, normal, feet and inches	17-7½
Displacement, tons	4,760
Speed, knots	22½
I.H.P.	15,500
Coal capacity (total) tons	1,000

Engines, twin screws; one four-cylinder, triple-expansion engine on each screw.

H.P. cylinder, diameter, inches	40
I.P. cylinder, diameter, inches	60
Two L.P. cylinders, diameter, each, inches	66
Stroke, inches	36
Revolutions per minute	150

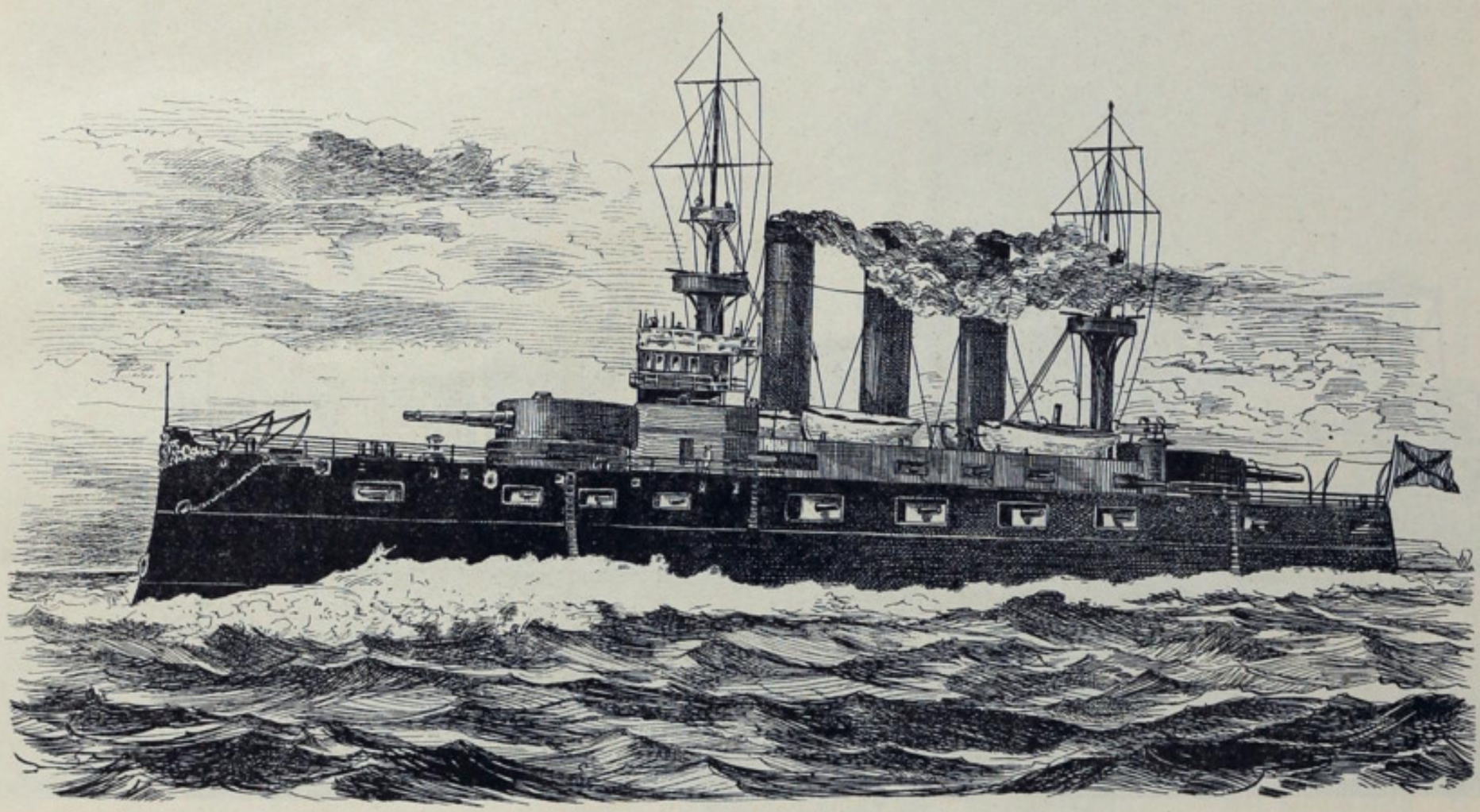
Piston valves on H. P. cylinder; slides on I. P. and L. P.; cast steel bed plates; forged steel framing.

Main boilers.—Twelve single-ended, cylindrical, four-furnace boilers. Working pressure 155 pounds.

ONE BOILER.

Mean diameter, feet and inches	14-0
Length over heads, feet and inches	9-3¾
Number of furnaces	4
Diameter of furnaces. Least, feet and inches	2-10
Diameter of furnaces. Greatest, feet and inches	3-2
Thickness, inches	½
Number of combustion chambers to each boiler	2.
Thickness of combustion chamber sheets, inches	9/16
Heating surface	
430 2¼-inch charcoal iron tubes, square feet	1,540.8
Four furnaces, square feet	140.2
Two combustion chambers	248.0
Heating surface, one boiler, square feet	1,929.
Heating surface, twelve boilers, square feet	23,148.
Area through tubes, one boiler, square feet	9.12
Grate area, one boiler, square feet	66.00
Ratio H.S. to G.S.	29.2 to 1.
Steam capacity 5 inches above top of combustion chamber, cubic feet	296.5
Morrison's suspension furnaces used.	
Thickness of shell plates, inches	11/16
Thickness of top parts of heads, inch	1
Thickness of tube sheets, inch	¾
Thickness of bottom parts of heads, inch	¾
Closed fire room, forced draft.	

The Chitose, of which the only picture yet made is presented as a supplement to this issue of the Review, will carry a heavier armament than either of the United States cruisers Minneapolis or Columbia. It will be supplied by the Japanese government and will consist of two 8-inch quick-firing guns at the sides, ten 4.7-inch quick firing rifles mounted in broadsides, with a secondary battery of twelve 12-pounder quick-firing rifles and six 2.5-inch Hotchkiss guns. There will be five torpedo tubes, 14 inches in diameter. This cruiser has two steel masts provided with fighting tops, in which the rapid firing guns will be placed. She is equipped with four powerful searchlights and there are eight steering stations to provide for almost any contingency. Engines are protected by solid steel hatches. Commander Ichibei Mori of the Japanese navy, who arrived at San Francisco early in January to take command of the Chitose, was so favorably impressed with the vessel that he ventured the opinion that a considerable portion of his nation's future contracts for war vessels would come to American ship builders.



First-Class Battleship for the Russian Navy, Building at Cramps' Yard, Philadelphia.—Pen Drawing from the Official Sketch Sent to St. Petersburg.

There can be no doubt that the Chitose will bring fresh laurels to the Union Iron Works. During the recent Spanish-American war the records made by the battleship Oregon, the cruisers Charleston, San Francisco and Olympia, the monitor Monterey and the gunboats Wheeling and Marietta were in each case the strongest kind of a testimonial to the quality of the work turned out by the San Francisco firm, and there is reason to believe that the battleships Wisconsin and Ohio, the torpedo boat Farragut and this new Japanese cruiser will rival them in credibility.

The Neafie & Levy Ship & Engine Building Co. of Philadelphia, has within the past few days closed a contract for a passenger and mail steamer for the Baltimore, Chesapeake & Richmond Steamboat Co. She will be 260 feet long, 46 feet beam, 17 feet depth, and fitted with triple expansion engines developing 13,200 horse power. A speed of 22 miles is expected of this vessel.

The Columbian Iron Works, Baltimore, Md., has been awarded the contract for the twin-screw steamer for the Hartford & New York Steamboat Co. She will replace the Hartford, a vessel of 220 feet length, 40 feet beam and 13 feet depth, which was recently purchased by the government. ....

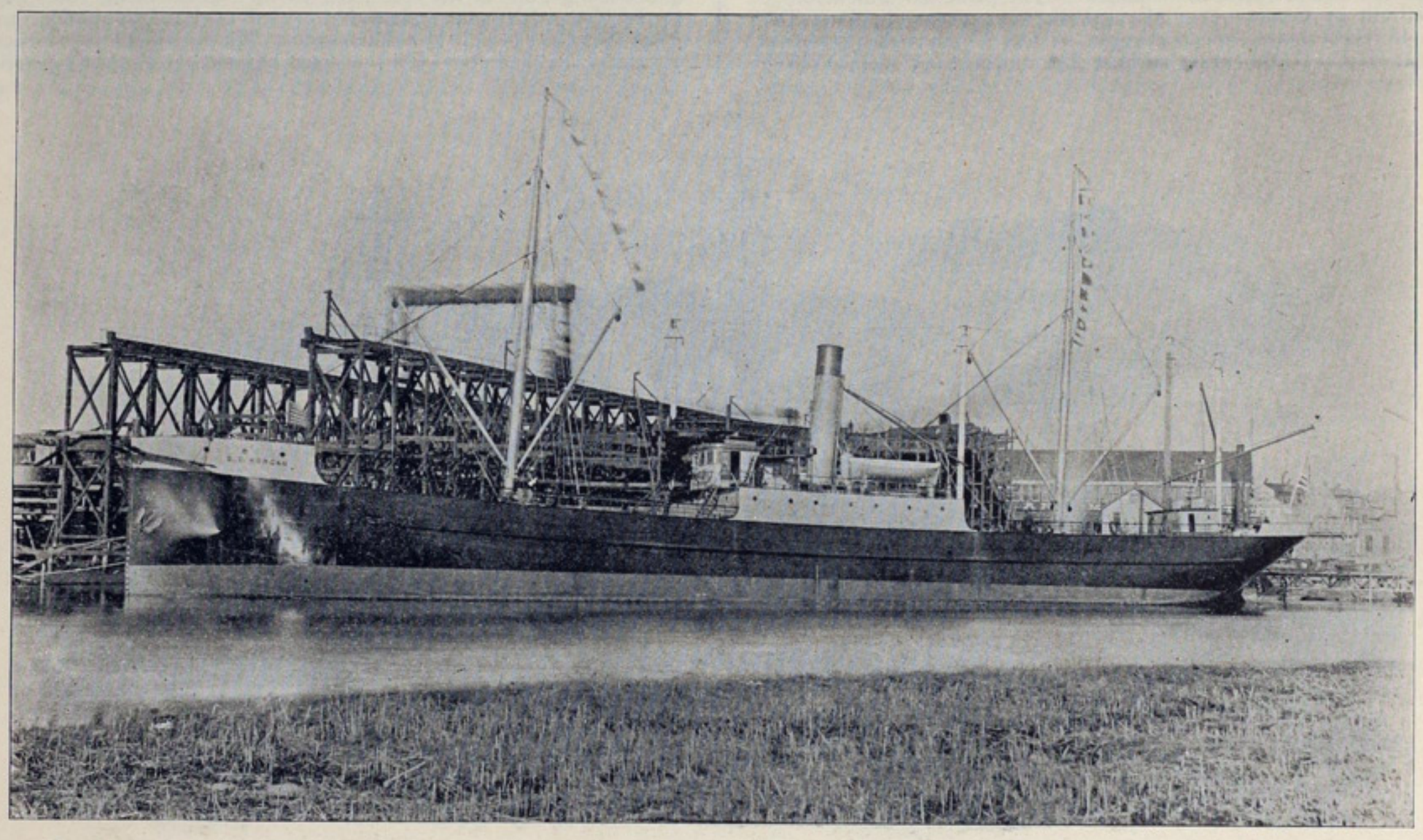
The Davis Dry Dock Co., Kingston, Ont., has closed a contract with P. C. Jones of Belleville, Ont., for a 16 horse power fore-and-aft compound engine for a new steam launch to be completed by April 1, next.

STEAMER S. T. MORGAN.

A VESSEL THAT COMPARES FAVORABLY WITH THE BEST TYPE OF BRITISH "TRAMP"—BUILT BY THE HARLAN & HOLLINGSWORTH CO., OF WILMINGTON, DEL.

The steamer S. T. Morgan, which the Harlan & Hollingsworth Co. of Wilmington, Del., recently delivered to the Virginia-Carolina Chemical Co. of Richmond, Va., and illutrations of which are herewith presented, is one of the staunchest and heaviest vessels ever turned out at the yard of the Wilmington company, and is said, by persons who have inspected her, to compare very favorably with the best type of British "tramp" steamer. The Virginia-Carolina company, which was formed in 1895 by the consolidation of eight large fertilizing companies, is now the largest manufacturer of chemicals and fertilizers in the world, having a capacity in excess of half a million tons per year. The company owns extensive phosphate beds near Charleston, and the Morgan, which is equipped to tow barges, will ply between this field and Richmond; with probably occasional trips to various Atlantic coast ports and even to Europe. The necessity for the utmost attainable stability in her construction will be apparent from a consideration of the service in which she is to be employed.

The Morgan is 275 feet over all, 261 feet between perpendiculars, 41 feet molded beam, with a depth of 21 feet at the side and 22 feet in the center. The hull is flat and has a plate keel. The frames are of angle steel and the vessel is fitted with four water-tight bulkheads. The upper deck is of steel and the lower decks are covered with first quality white pine 3 by 4¾ inches in size. The bridge house measures 50 feet and there are two wooden masts. Quarters for the crew are provided in the forecastle.



Steamer S. T. Morgan, Built by the Harlan & Hollingsworth Co., Wilmington, Del., for the Virginia-Carolina Chemical Co., of Richmond, Va.

Power for propulsion is provided by direct acting, triple expansion, compound engines with inverted cylinders. The cylinders are 20, 33, and 50 inches in diameter by 36-inch stroke. Steam is supplied from two Scotch boilers of the cylindrical, return-tubular type, 12 feet in diameter by 11½ feet in length, with a working pressure of 165 pounds. Morrison furnaces are used. The equipment of the vessel is first class in every respect, and includes a steam towing machine, manufactured by the American Ship Windlass Co. of Providence, R. I., steam and hand steering gear, tanks for fresh water for cooking purposes and for supplying the boilers, donkey and deck pumps, life boats, rafts and Baldt stockless anchors.

The steamer, which is of 1,836 gross or 1,122 net tons burden, was constructed in accordance with the stipulations of Lloyd's and the American Shipmasters' Association, by which latter she is rated A 1. Her normal draft with a cargo of 2,500 tons is 15 feet, and she can maintain a speed of 10 knots at sea. A feature of the vessel is the system of water ballast provided.

M. T. Davidson, well-known pump manufacturer of 43-53 Keap street, Brooklyn, N. Y., is experimenting on a compound vertical feed pump, which he believes will prove a decided improvement from the standpoint of economy. Among the vessels now building which will have Davidson pumps is the new Corsair, building for J. P. Morgan of New York City. Mr. Davidson takes considerable pride in the fact that the Gloucester, formerly the yacht Corsair, went all through the Spanish-American war, undergoing the hardest kind of service without it being necessary to expend a dollar for repairs to the pumps or air pumps, all of which were furnished when the vessel was new. Davidson pumps are also being placed on the United States cruisers Atlanta and Chicago, now being rebuilt.

MACHINERY FOR TORPEDO BOATS AND DESTROYERS.

The fact of the recent award by the United States navy department of contracts for torpedo boats and destroyers having been made in a number of instances on plans submitted by the bidders has naturally aroused considerable interest in the machinery installations of these vessels for comparative purposes. The Marine Review has been at some pains to secure from the more prominent builders engaged on these contracts, particulars of the engines and boilers. The George Lawley & Sons, Corporation, South Boston, Mass., is placing in the torpedo boats Blakeley and De Long engines with cylinders of 14, 22, 25¼ and 25¼ inches diameter by 18 inches stroke, and water tube boilers. The Wolff & Zwicker Iron Works, Portland, Ore., has placed in the torpedo boats Davis and Fox four cylinder triple expansion engines, each of 1,750 horse power. Cylinders are 11⅞, 19, 22⅞ and 22⅞ inches by 15 inches stroke. Engines for the torpedo boat Goldsborough are of the same type, and each of 3,000 horse power; cylinders 19½, 31¾, 35 and 35 inches by 18 inches stroke. Thornycroft boilers are to be fitted in all three boats.

The engines which the Columbian Iron Works, Baltimore, Md., is to place in the torpedo boat Tingey, are duplicates of those to be fitted by the Lawley corporation, but Thornycroft boilers of 250 pounds working pressure will be installed. The Fore River Engine Co., Weymouth, Mass., which has the contract for the torpedo boat destroyers Lawrence and Macdonough, are building for those boats four-cylinder triple expansion engines, with cylinders 22, 31, 34 and 34 by 20 inches stroke; 360 revolutions and 4,200 indicated horse power. Steam will be supplied by four Fore River water tube boilers, 320 square feet grate surface and 18,000 square feet heating surface. In the destroyers Hopkins and Hull and the torpedo boat Stringham, the Harlan & Hollingsworth Co., Wilmington, Del., will place engines with cylinders 22, 32½, 34 and 34 inches by 18 inches stroke, and Thornycroft water tube boilers with a working pressure of 240 pounds. The Union Iron Works, San Francisco, contractors for the torpedo boat destroyers Paul Jones, Perry and Preble, will fit engines of 20½, 32, 38 and 38 inches by 22 inches stroke. The W. R. Trigg Co. of Richmond, Va., will place engines of the same dimensions in the destroyers Dale and Decatur. In the torpedo boats Shubrick, Stockton and Thornton, the Trigg company will install triple expansion engines, with cylinders of 14, 22, 25¼ and 25¼ inches by 18 inches stroke.

The Calvin Co. of Garden Island, Ont., launched on Jan. 4 the steamer India. She is 212 feet in length, 37 feet beam, 15 feet depth, and is built of white oak. She is fitted with triple expansion engines, having cylinders of 18, 30 and 48 inches diameter by 30 inches stroke. Her propeller wheel is 10 feet 7 inches in diameter, with a pitch of 12 feet. Steam is supplied by two Scotch boilers, 11 feet 5 inches in diameter by 12 feet long, with 160 pounds pressure. The vessel is equipped with steam steering gear, etc.

C. H. Carter & Co., Belfast, Me., have just closed a contract to build a large schooner for Pendleton Bros. of Ilesboro, Me. It is claimed that Carter & Co. is the oldest ship building firm in the country from the standpoint of continuance under one name. They have operated the yard which they now occupy for more than fifty-five years, and in that time have built 130 vessels.

The laying down of a ship building yard at Dunkirk, France, for the construction of large cargo boats is now definitely decided upon, the necessary capital having been subscribed. The minister of public works has invited engineers to send in plans. The company will be called "Société des Ateliers et Chantiers de France."

CRESCENT SHIP YARD OPERATIONS

Ship builders of the United States have been not a little surprised of late by the showing made during 1898 by the Crescent Ship Yard of Lewis Nixon, at Elizabethport, N. J. The yard has a water front of only 400 feet, and yet there were turned out during the year a total of twenty-five vessels, or in other words a complete vessel (none of them very large, of course) every two weeks. The vessels delivered and accepted during the year include the Mercedes, sternwheel passenger and freight steamer for the Magdalena river, South America; Jennie M., sternwheel exploration steamer for the Angelo Heilprin expedition on the Yukon river Alaska; Doctor Townshend, side-wheel exploring steamer, drawing but 6 inches of water for use in Alaska; Nulato, sternwheel passenger and freight steamer for the Yukon; Elreba, large steam yacht for Mr. Darlington of Pittsburg; James Deitrick, sternwheel steamer for the Yukon; Antioquia, sternwheel passenger and freight steamer for service in South America, carrying 250 tons of freight on 24 inches draft; Empire barges Nos. 1, 2, 3 and 4, freight barges for the Yukon; barges Yukon, Tanana Munook and Dawson, passenger barges for the Empire company; two steamers, the Empire and International, having six propellers each and drawing only 24 inches, capable of towing four barges each at 10 miles an hour; the steam houseboat Troudoun; Jennie K., sternwheel steamer for Alaska; Standard oil barges Nos. 52 and 72; United States navy waterboats No. 1, No. 4 and No. 5.

In the yard at the opening of 1899 are the unfinished steamer Pathfinder, building for the United States Coast and Geodetic Survey, the 26-knot torpedo boats O'Brien and Nicholson, the monitor Florida, a large steam yacht and several small steamers. The steamer Rita is also being refitted as an army transport. Mr. Nixon's ship yard staff now consists of Charles Ackerman, assistant manager; George B. Martin, secretary; M. P. Campbell, chief engineer; Eric Ewertz, chief hull draughtsman, and Alex. Kaufmann, book-keeper.

W. J. Clark of the General Electric Co. has accepted the position of general manager of the foreign department of that company with headquarters in New York. In the reorganization of the foreign department, Mr. D. Mazonot, who for five years has held the general managership, and who has piloted it from its small beginnings to its present position as one of the foremost departments of the company, becomes managing director of the Mexican General Electric Co. with headquarters in the City of Mexico. In view of the importance which our recent foreign acquisitions and our improved relations with foreign countries will give to our commerce, especially in the field of electrical development, the scope of the foreign department will necessarily be greatly widened. This department will have charge of all commercial relations between the General Electric Co. and all countries outside the United States.

Mr. Clark's wide experience in foreign commercial matters peculiarly fits him for his new position. His book "Commercial Cuba," recently published, is an authority on Cuban commercial affairs.

Tarr & James, Essex, Mass., have closed a contract to build a fishing schooner for Capt. Robert Corey. E. L. Rowe & Son of Gloucester, Mass., have the contract to fit and rig the vessel.

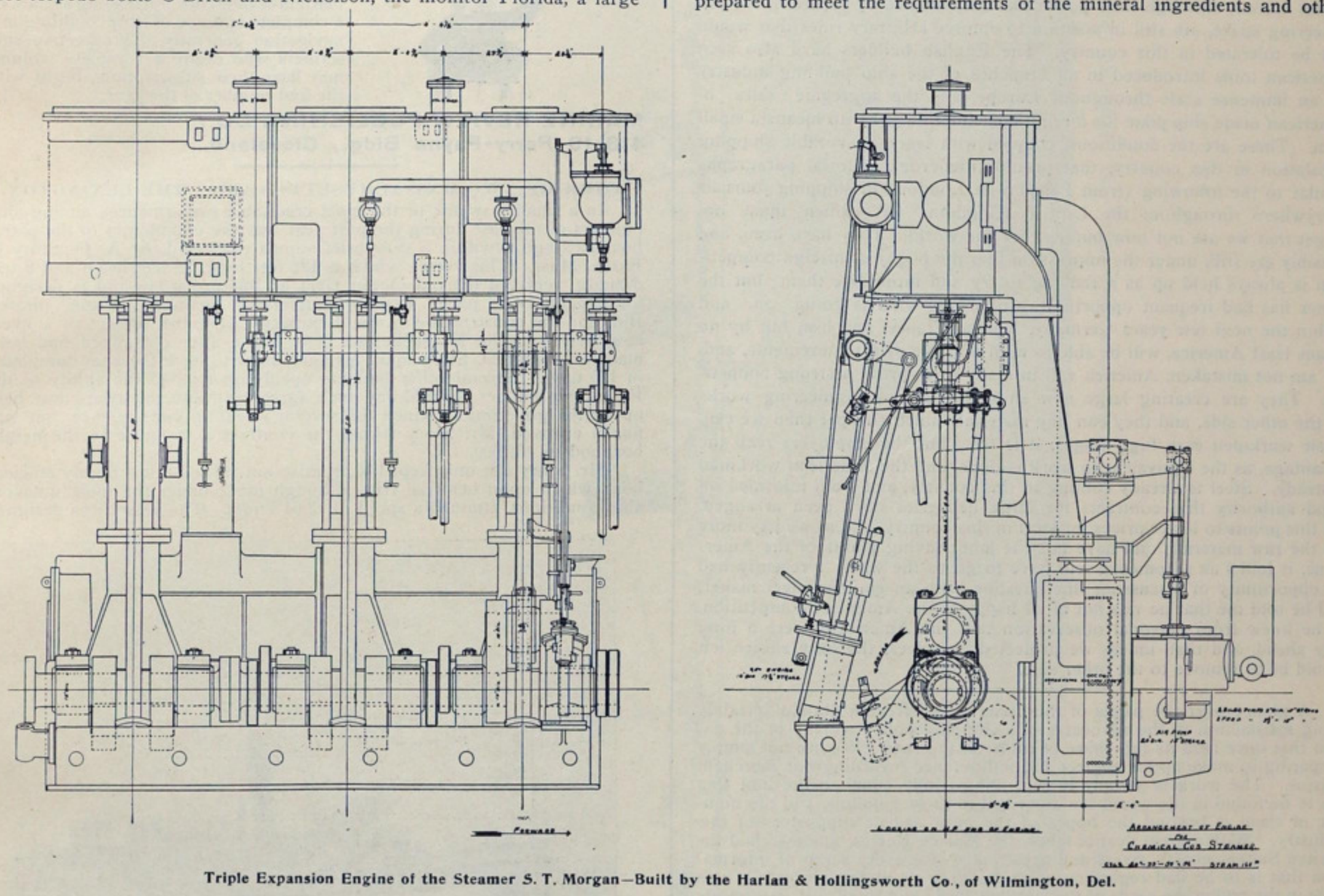
A COMMENDABLE PLAN.

Marine engineers generally will commend the plan recently adopted by the Dearborn Drug & Chemical Works of Chicago, well-known manufacturing and analytical chemists and makers of vegetable boiler compounds. It is nothing less than to prepare each consignment of compounds with special reference to an analysis of the water and scale submitted by the particular customer for which it is intended. Experience has proven that this plan reduces failure to a minimum. The mixture for which the firm now finds the greatest demand is a semi-solid vegetable extracted matter, thick like brown paste and very soluble in hot or cold water. It is mixed in two or three parts of water and distributed during six or twelve hours. One pound to each ton of coal is required on clean boilers, while on dirty boilers two or three pounds is required to each ton of coal until the boilers are clean. As noted above the Dearborn company has with its extensive and completely equipped laboratory made preparations to overcome in a scientific manner the different known deleterious actions taking place in a steam boiler, by analyzing the feed water and making a diagnosis of the case in hand. They have no proprietary article on hand, but after learning with what they have to contend write a prescription for the ingredients and give such directions as will be suitable for the water used under the given conditions. This prescription is sent to the works, where it is filled, filed, recorded and numbered and can be refilled when wanted, the same as a prescription is handled by a dispensing pharmacist in a drug store.

The compounds are of purely vegetable composition, analytically prepared to meet the requirements of the mineral ingredients and other objectionable constituents of the water, the percentage of each mineral salt governing the percentage of the antidotal ingredient of the compound. By these methods it is easy to avoid the use of an excess or deficiency of any part of the compound, every pound being utilized in the reaction taking place. There is no mechanical, unknown or unlooked for result obtained; the methods of this company cause a complete chemical reaction to take place between the deleterious constituents of the water and the ingredients of the compounds.

This company has also assumed the position of oil chemists and inspectors to the steam user, and are marketing a line of very high-grade lubricating oils through their laboratory inspection. The Dearborn company and the refining company are kept separate—the refining company refining the oils on the Dearborn laboratory specifications and shipping to the Dearborn company subject to their laboratory inspection. All such goods must come up to grade or are returned at the refining company's expense. The company re-strains every individual package separately, taking the flash and fire tests, the viscosity test, the gravity and cold tests of each package, and if found perfect the same is sealed and a tin tag put over the seal, carefully painted, and the consumer is cautioned not to receive a package if the seal is broken or has been disturbed.

All scientific investigation and analytical work relative to the subject is carried on free for customers. Instructions for the sending of samples of incrustation, water, etc., will be readily furnished without charge and reports of analyses mailed upon application to the main office of the company, Rialto building, Chicago.



Triple Expansion Engine of the Steamer S. T. Morgan—Built by the Harlan & Hollingsworth Co., of Wilmington, Del.

MARINE REVIEW

Devoted to the Merchant Marine, the Navy, Ship Building, and Kindred Interests.

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With an output in excess of one and a half million tons the year 1897 has established a record in the annals of British ship building, and the prospects for the immediate future on the other side seem fully as hopeful as they are in this country. But there is no denying the fact that the representatives of this great industry throughout England and Scotland are greatly disturbed on account of the positive indications of competition from the United States. They have just passed through a year of strained relations between employers and employed, with the greatest strike in the engineering trade ever known. The iron workers have shown little consideration, it is claimed, for their employers, and the trades unions, although their power has been shaken by failure in the engineering strike, are still in position to enforce arbitrary rules that would not be tolerated in this country. The English builders have also seen American tools introduced in all branches of the ship building industry on an immense scale throughout Europe, and the aggregate sales of American made ship plate for foreign consumption is by no means a small item. These are the conditions, coupled with fear of favorable shipping legislation in this country, that prompt numerous editorial paragraphs similar to the following (from Fairplay of London) in shipping journals everywhere throughout the United Kingdom: "Workmen must not forget that we are not now builders for the world. They have been, and possibly are still, under the impression that the bogey of foreign competition is always held up as a red rag to try and intimidate them; but the writer has had frequent opportunities of seeing what is going on, and within the next few years Germany, Russia, France, and last, but by no means least America, will be able to fulfil all their own requirements, and, if I am not mistaken, America will in many ways prove a strong conpetitor. They are creating large new shipbuilding and engineering works on the other side, and they can buy materials much cheaper than we can. Their workmen earn high wages, it is true, but the employers reap the advantage, as the equivalent in work is done, and the American workman is steady. Steel is already coming to this country, and I am informed on good authority that contracts for large deliveries have been arranged. All this points to lower prices for steel in this country, and as we pay more for the raw materials and have not the labor-saving plants of the Americans, it looks as if someone will have to go to the wall. I recently had an opportunity of discussing this question with an eminent steel maker, and he told me that he was not at all happy at the American competition, as he knew from personal observation that the Americans were a long way ahead, and that, unless we protected ourselves, the only choice left would be to remove to the other side."

A glance over the pages of this issue of the Review should certainly bring satisfaction to the advocates of a shipping policy worthy of the nation that once held its full share of trade on the seas. We are not simply preparing to make up for neglect and indifference regarding our merchant marine. The work is already begun. Ships fully equal to the best that are to be found in the world are described in these columns, and the number of them is beyond the hopes of the most ardent supporters of this industry. With a great deal of labor, the Marine Review has searched the United States—coasts, rivers and great lakes—for every scrap of information that is to be had regarding ships building or under contract at this time in the numerous yards of the country, large and small. It is certainly a source of gratification to find that if we include some fifty-eight naval vessels—a wonderful record in government orders—the ship yards of the country are now supplied with work sufficient to keep most of them, and especially the larger ones, actively engaged for the next three years. Several new ship building and engineering works of large proportions have been created within the past year. The Carnegie Steel Co. and other manufacturers of ship building material have made sales within the year of large quantities of steel plate for delivery to foreign ship builders. All of the large tool concerns have had their agents scouring the engineering works of Europe and their sales have been phenomenal in the ship yards, as well as in establishments generally where metal working tools are required. All this without any reference to the avowed policy of the present administration at Washington to provide adequate aid to American ships in the foreign trade in competition with aided foreign ships. There is certainly a grand future in store for the shipping interests of this country, if the beginning already made with the building of ships for our own trade is to be followed by the passage of the Hanna-Payne bill, now before congress, and which will, if passed, result in the construction of two or three hundred thousand tons of new ships for the foreign trade at an expenditure of many millions of dollars during the next few years. Never before has there been such a union of the shipping, ship building, manufacturing and mercantile interests on a measure of this kind. It is undoubtedly the most thoroughly practical and equitable plan for accomplishing the end desired, and will, in all probability, meet with approval from the present congress. Then look for a steady march of ship building progress in the United States.

THE MARINE REVIEW IN 1899

EVERYTHING points to an activity in ship building during the ensuing year, unprecedented in the history of the industry in America. The large number of orders for merchant ships, the extensive naval program contemplated, and the numerous contracts placed for expensive steam yachts demonstrate this beyond the peradventure of a doubt. Naturally everybody interested in naval affairs or shipping pursuits will want particulars of these new vessels at the earliest possible moment. The REVIEW will endeavor to supply this, as well as full reports of tests and trial trips, as soon as obtainable. The data will in almost all cases be accompanied by photographs or working drawings, which will frequently, as in the past, be published in the REVIEW long in advance of their appearance in other publications.

THE SUBSCRIPTION PRICE OF THE REVIEW IS $2 PER ANNUM. In the offices of many of the leading ship builders and naval architects of this and other countries files of the REVIEW are kept for matters of reference, furnishing as they do a complete epitome of ship building and navigation generally. Prospective subscribers who desire a complete volume may have their subscriptions begin with the first number of the year.

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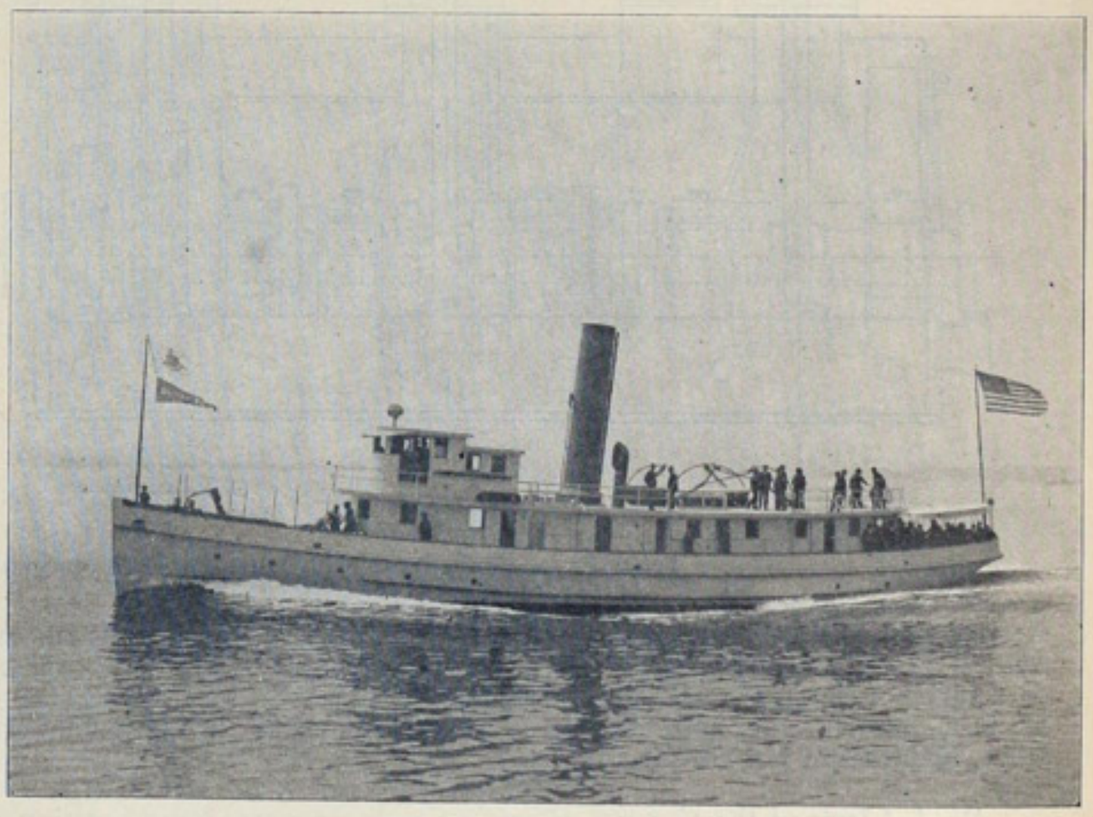
WORK OF TWO MASSACHUSETTS YARDS—THE LEXINGTON.

In a small way one of the most creditable performances among ship builders of the east during the past year was the completion of the patrol boat Lexington within a very brief stipulated period, by A. D. Story of Essex, Mass. This vessel, which is 122 feet long, 22 feet beam and 9 feet draught, replaced the old Ocean Gem at Buzzard's bay and is designed for general coast patrol service, particularly against "porgie" pirates. Bids for the construction of the Lexington were the subject of a lively controversy at the Massachusetts state house after the award had been made to Arthur D. Story upon his agreement to have the boat completed in 125 days. Several other builders openly questioned the ability of the Essex ship builder to fulfil any such agreement, and the award was held up by the governor's council for several weeks in consequence, but was finally aproved, Mr. Story taking the contract at a figure in the neighborhood of $50,000.

Mr. Story not only kept his promise but turned out a highly efficient boat, which upon her trial trip, although made under the most unfavorable conditions, attained a speed of 13.04 knots. The vessel was designed



PATROL BOAT LEXINGTON, BUILT BY A. D. STORY ESSEX, MASS.

by W. E. Waterhouse of Boston, Mass., and her machinery was built by Bertelsen & Petersen. She carries a rapid-fire gun and is otherwise equipped for the service in which she is engaged.

The year just closed, while showing no activity in its opening months, was on the whole a pretty satisfactory one for Essex ship builders. Ten vessels, with a tonnage of 1,746 (carpenters) tons, were turned out, as against nine vessels of 1,234 tons in 1897. James & Tarr launched the schooners Mattakeesett, 174 tons; Juniata, 174 tons; Admiral Dewey, 194 tons, and a schooner yet unnamed of 96 tons; total, four vessels of 638 tons. A. D. Story launched the schooners Dawson City, 180 tons; Mary P. Mosquita, 128 tons; Helen F. Gleason, 135 tons; steamer W. H. Moody, 300 tons, steamer Lexington, 225 tons, and schooner Esther Anita, 190 tons; total six vessels of 1,108 tons. As will be noted in the summary of vessels building, throughout the United States, presented elsewhere in this issue, Mr. Story is now working on two schooners of 72 and 106 tons, respectively, valued at $7,000 and $9,000. James & Tarr also have a schooner of 194 tons on the stocks, and both yards have the prospect of additional contracts in the near future.

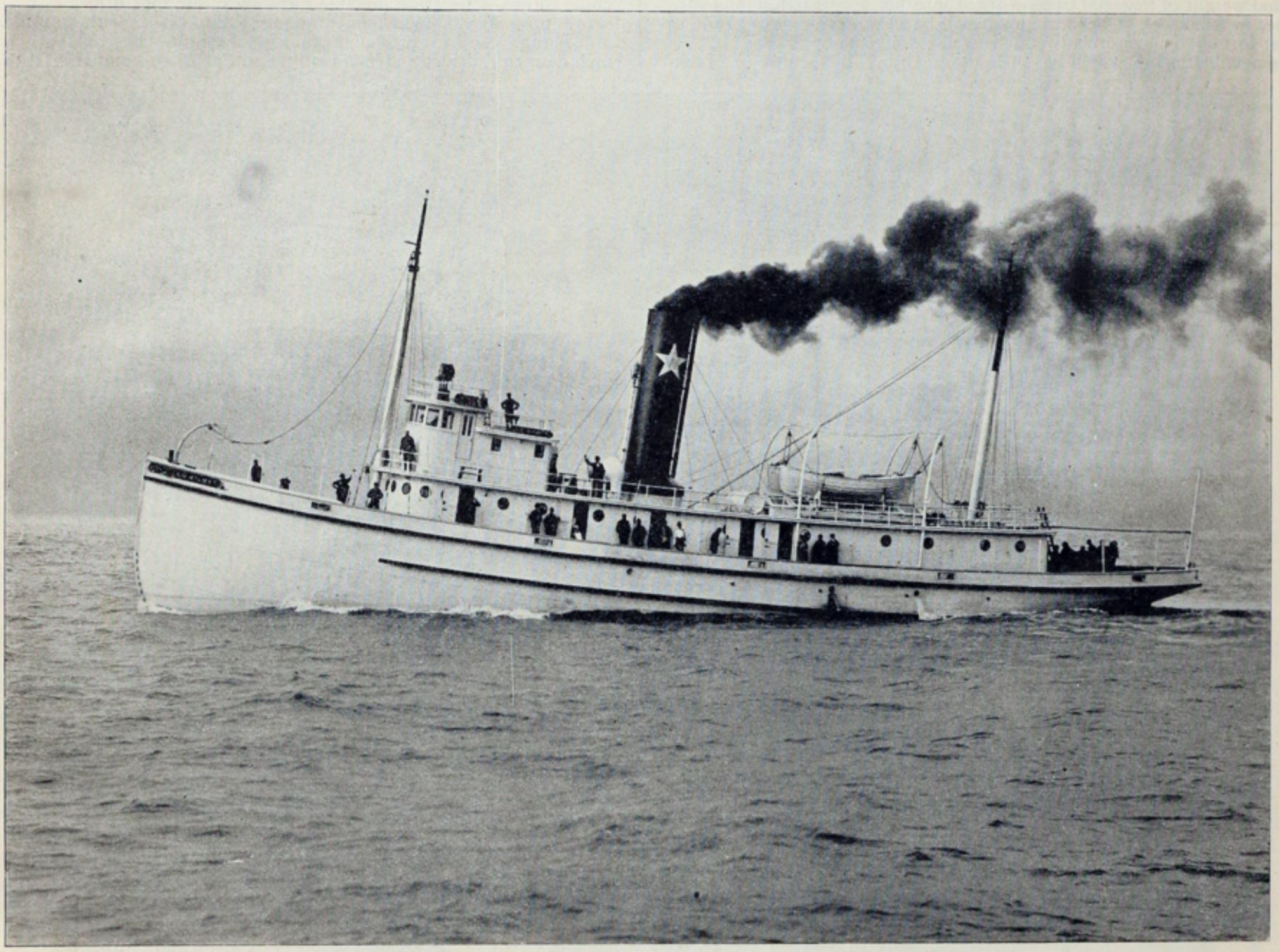
MOST POWERFUL AMERICAN TUG.

THE TOWING STEAMER ROBERT W. WILMOT, BUILT BY THE GLOBE IRON WORKS CO., CLEVELAND, FOR W. G. WILMOT & CO., NEW ORLEANS, LA.— HER VOYAGE FROM LAKES TO GULF.

The Globe Iron Works Co. of Cleveland has just delivered to W. G. Wilmot & Co., towing and wrecking contractors of New Orleans, La., the sea-going steel tug Robert W. Wilmot. In her voyage of 4,418 miles from the great lakes through the Welland canal, down the St. Lawrence river, Atlantic and Gulf coasts and up the Mississippi river to her destination this tug was subjected to a very severe test structurally and also as regards her general seaworthiness. The Wilmot, while not the largest, enjoys the distinction of being, according to her builders and owners, the most powerful sea-going tug in America. She left Cleveland Oct. 15, 1898, and after weathering a heavy storm on Lake Ontario, reached Ogdensburg Oct. 20. She remained at Ogdensburg until Nov. 8, and then started through the St. Lawrence canals to Montreal, where she arrived Nov. 15 and took on coal. The tug was delayed at Pictou, N. S., three days by fog, and soon after leaving Port Mulgrove, N. S., encountered the heavy storm that did so much damage to shipping along the New England coast. From that time her entire journey down the coast was interspersed with constant buffeting of storms. She put into Norfolk, Va., for coal and stores. As soon as she cleared from that port she encountered rough weather again and steamed through heavy seas the entire distance to Charleston, S. C. Another storm was raging when she put to sea, and finally a bit of very bad weather was experienced after the vessel passed around the Florida Keys and into the Gulf of Mexico. The statements of the officers and crew of the Wilmot constitute a splendid tribute to her builders. They say that she stood the heavy seas admirably, no flaw in her construction or weak point being discovered at any time. Indeed, the only evidence of rough experience was found in the discoloration of the paint and exposed steel work about the deck, pilot house and cabin, caused by the floods of water that passed over the vessel. Naturally the owners are pleased with the sea-going qualities.

The Robert W. Wilmot is designed to replace the former Robert W. Wilmot, built for Wilmot & Co. in 1897 by Wheeler & Co. of West Bay City, Mich., but which was purchased by the government at the outbreak of the recent war and renamed the Potomac, and which will probably be retained permanently by the navy department, by reason of the fact that she is the only tug now in the fleet sufficiently powerful to tow a battleship with ease. The new Robert W. Wilmot is 156 feet 8 inches over all; 143 feet 4 inches between perpendiculars; 30 feet beam, molded; 17 feet 6 inches depth, molded; spring of beam, amidships, 7 inches. The mean draught when loaded for sea is 14 feet. The tug has a coal capacity of 250 tons; 2,100 indicated horse power of engine or 2,200 collective horse power, including pump engines, and, according to the contract, developed a speed of 20 knots. A feature of the tug is the elaborateness of the interior furnishing, a provision made in view of the fact that the Wilmot will frequently be required to carry underwriter representatives to and from wrecks, and it may be necessary at times for them to live aboard for several days. The interior of the pilot house, owner's room, engine room, dining room and officers' rooms are neatly paneled with mahogany, and all the ceilings are paneled with white pine, the moldings being gilded.

In the hull construction there have been used plates of open hearth mild steel of a tensile strength of 55,000 pounds per square inch. The deck plating is of a 12½-pound quality, except under the windlass and capstan, where 15-pound plating has been used. There are five water-tight bulkheads. The deck house is constructed entirely of steel. Aft of the store room is a room for three firemen and a lamp room with suitable shelves and fittings. The engine room is neatly paneled in black walnut and has a grating for cross passage through the deck house. The owner's room is located in the after end of the deck house on the starboard side. It is also finished in black walnut and has a double berth, lounge, office desk, water closet and other necessary outfit. The deck house has a continuous inside passage. Forward is the mess room, ceiled with white pine, and abaft of the mess room is the galley. Following in order are a bath room, store room and two water closets. The steel pilot house is located on top of the main deck house. The tug has considerable shear, and, as may be seen from the accompanying illustration, presents a very graceful appearance. The vessel has two steel masts. A fresh water tank of 1,000 gallons capacity is located forward in the lower hold. A refrigerator is also provided and a steam heating plant embraces every room in the vessel. Forward of the coal bunker, below deck, space is provided for a crew of twenty men.



Most Powerful Sea Going Tug in America—The Robert W. Wilmot, Built by the Globe Iron Works, Cleveland, for W. G. Wilmot & Co., New Orleans.

The power for the propulsion of the vessel is provided by one of the Globe company's triple expansion engines of the direct-acting vertical type. The cylinders, arranged fore and aft, are 21, 33½ and 55½ inches in diameter by 42 inches stroke. The main valves are of the piston type for high pressure, intermediate pressure and low pressure cylinders. All valves are worked by the Stephenson link motion, having adjustable cut-off. There are two boilers of the return tubular type, 12 feet 6 inches in diameter by 12 feet long, with three Adamson furnaces, 40 inches in diameter. A steam pressure of 185 pounds per square inch is allowed. The boilers are equipped with the Ellis & Eaves' induced draft. The tug is equipped with an independent duplex air pump of the admiralty pattern, a circulating pump, boiler, feed, cooler and deck or fire pumps. The wrecking pump has a capacity of 60,000 gallons per hour. The vessel also has a double-barrel capstan with quick gear engines, manufactured by the American Ship Windlass Co. of Providence, R. I., and a Shaw & Spiegle towing machine, supplied by the same firm. A Williamson worm geared steam steerer is also provided. The electric light plant, which was installed by the General Electric Co., consists of 250 incandescent lamps, a 20-inch search light and six portable cargo lamps for use in wrecking operations. The completed vessel costs considerably over $100,000.

BATTLESHIP SHIKISHIMA.

LARGEST FIGHTING SHIP AFLOAT—BUILDING FOR THE JAPANESE NAVY BY THE THAMES IRON WORKS & SHIP BUILDING CO., OF ENGLAND.

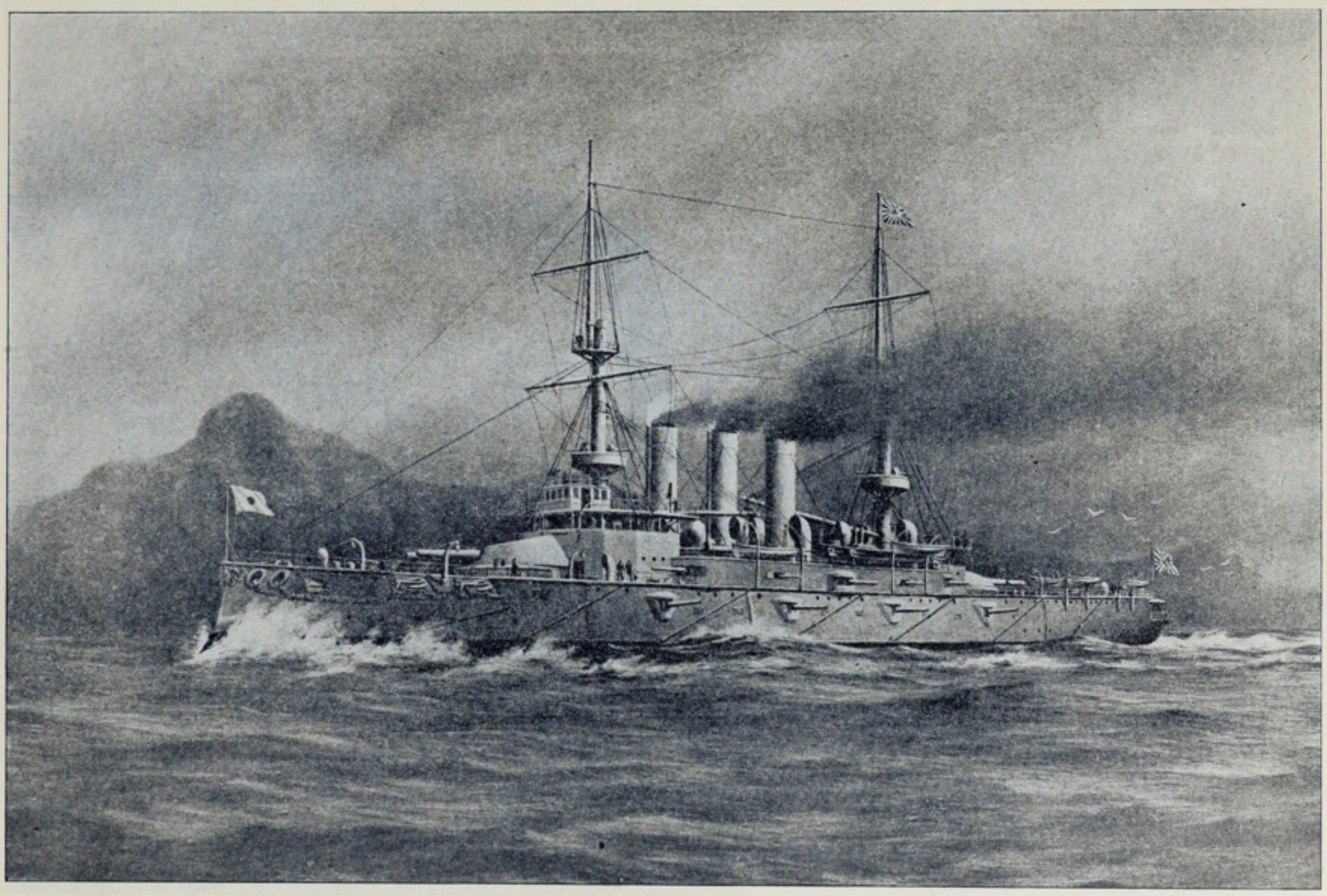
Students of naval architecture have already found and will probably continue to find much to interest them in the battleship Shikishima, building for the Japanese government, and which was launched some two months ago by the Thames Iron Works & Ship Building Co. The new vessel, work on which was begun in March 1897, is 440 feet over all, 400 feet between perpendiculars, 75 feet 6 inches beam, 27 feet 3 inches mean draught, and 14,950 tons displacement, and 18½ knots speed. The Shikishima will, when completed for sea, be the largest and most powerful battleship afloat, seeing that the largest vessels of her class in the British navy are but of 14,900 tons displacement when their bunkers are filled with 900 tons of coal, leaving but 14,000 tons for the weight of the vessel, her machinery, armament, etc., whereas the new Japanese battleship, with her 14,950 tons displacement, and a coal-carrying capacity of 700 tons only, will have 250 tons more weight in her hull, engines, and armament, than vessels of the Majestic class. Being intended for home service and not required to carry the imperial flag to distant parts of the world, the decrease in the coal carrying capacity of the Shikishima has enabled an additional weight of material to be worked into her construction, and thus made her in defensive, as her armament will be in offensive power, one of the most formidable armorclads constructed for any navy.

The new battleship, which has been designed by Mr. George C. Mackrow—the veteran naval architect of the Thames Iron Works Co.—and his staff, is built on the bracket frame system, with wing passages at the sides, which will be used for coal stowage. Her bottom, which is cellular, is connected with water-tight flats at both ends, practically making her a double-bottomed ship throughout. For side protection the ship has an upper and lower armor belt of Harveyed nickel steel; the lower belt, 8 feet 2 inches in depth, extending from stem to stern, is 9 inches thick throughout the length of the machinery and magazine spaces, tapering to 4 inches thick at the ends. The upper belt for the protection of the gun battery, and which covers the sides for 250 feet in length amidships to the height of the main deck, and encloses the two barbettes, is of 6 inch armor. Within the main or lower armor belt, and rising from its lower edge to a height of 2 feet 8 inches above the water-line, is a complete armored steel deck extending from stem to stern 2½ inches thick, an extra plate 1½ inch thick being worked on the slopes of this deck within the citadel, making a thickness of 4 inches of steel at these parts; further deck protection is also afforded by the main deck being composed of plates 1 inch thick in the way of the citadel.

At either end of the 250 foot armor belt, which forms the sides and determines the length of the citadel, and on the center line amidship, are placed the two barbettes, which, circular in form and protected with 14 inch armor, rise from the protective deck to about 4 feet in height above the upper deck, curved athwartships steel bulkheads being worked between the decks from the barbettes to the ship's sides.

The armament of the Shikishima consists of four 12 inch 40-calibre breech-loading guns, two being in the forward and two in the after barbette; fourteen 6 inch 40-calibre quick-firing guns, each mounted in a casemate armored with 6 inch Harveyed nickeled steel; eight casemates being on the main deck, and six on the upper deck; all made water-tight on their inner and outer sides, thus serving to protect the gun crews from explosive shells entering between decks, and preventing water finding its way there through a damaged gun port. In addition to the above detailed guns, there are twenty 12-pounder quick-firers on the upper deck, and twelve 3-pounders distributed on the upper and main decks, military tops, and on the bridges. There are also fitted five 18 inch torpedo tubes, one forward above water and four submerged.

The propelling machinery of the Shikishima is being supplied by Messrs. Humphrys, Tennant & Co. of Deptford, England, the same firm who engined the cruiser Yoshino, of Yalu fame, and the battleship Fuji. It consists of two independent sets—in separate engine rooms—of three cylinder triple-expansion engines, which will be of 14,500 indicated horsepower, and have cylinders 34 inch, 53 inch, and 84 inch diameter for high, intermediate and low-pressure respectively, with a piston stroke of 4 feet, the cylinders being each carried independently by cast iron supporting columns at the back, and forged steel columns in front; the crank shaft-bearing brackets by which the columns are carried being of cast steel. The crank shafts, which are in three parts, and interchangeable, are of steel, 16 inches diameter, and hollow; the propeller shafting is of the same material, 15 inches diameter; and the thrust blocks are fitted with horseshoe collars lined with white metal. Each set of engines drives a three-bladed screw propeller 17 feet diameter and 18 feet pitch, with gun-metal boss and manganese bronze blades; the set of engines has one air pump 24 inch diameter, driven independently, and one brass condenser with a tube-cooling surface of 7,750 square feet. The circulating water is supplied by independently-driven centrifugal pumps, which are arranged to clear the ship of water in case of flooding.



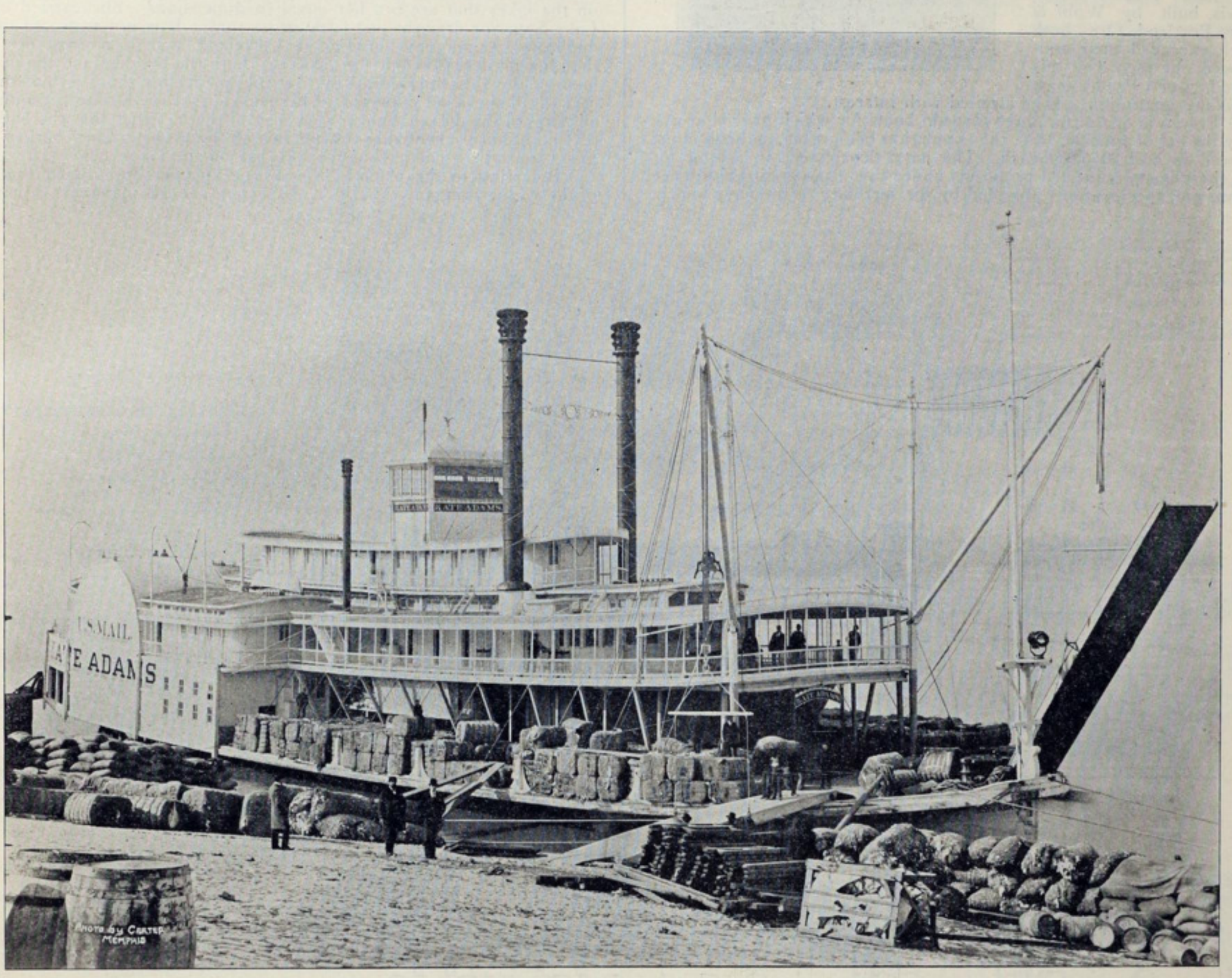
First-Class Twin-Screw Battleship Shikishima, 14,850 Tons.—Building at the Thames Iron Works, England, for the Imperial Japanese Navy.

Steam is supplied by twenty-five water-tube boilers of the latest improved Belleville type, having an aggregate heating surface of 37,936 square feet, each boiler being made up of seven or eight elements—there are two sizes—of 4½ inch diameter tubes. In each boiler uptake is fitted an "economizer," or feed-water heater, made of 2¾ inch diameter tubes connected at their ends by junction boxes in the same way as the "elements" of which the boilers are composed, which heater delivers the feed-water to the boiler at a temperature of 260 deg. The boilers, which have a total grate surface of 1,141 square feet—there being but one fire-grate to each—will be worked at a pressure of 270 pounds per square inch, which is reduced at the engines to 210 pounds.

The Shikishima will be steered by means of Cameron's patent self-regulating steering gear, the steering engines for working it being in duplicate, placed in separate water-tight compartments, as now adopted in ships of the class in the British navy. These engines will be controlled from five different stations in the ship; the controlling of the steering gear from these stations being maintained by hydraulic telemotors. The ship has two military masts, with double tops to each; the lower for fighting purposes and the upper for searchlights and signalling. She will be lighted throughout by electricity, the installation—supplied and fitted by the Thames Ironworks Co.—consisting of six search-lights, with 24 inch diameter projectors and Mangin mirrors. Four dynamos, with their driving engines, three of 400 amperes and 80 volts, and one of 200 amperes and

80 volts, supply the current, about 700 incandescent lamps being used in lighting the ship.

The Shikıshima, being intended for a flag ship, will be manned by a crew of 741, which will include an admiral and thirty-eight officers, accommodation for the latter being provided on the main deck, the admiral's quarters being right aft, his saloon, a capacious apartment, looking out on to the stern gallery or walk. Forward of this saloon are the ward and dining-rooms, and on either side of the ship forward of these are the officers' cabins. In connection with these apartments it is to be noted that, wherever possible, wooden fittings have been substituted by steel or other metal, the bulkheads dividing the cabins being of corrugated sheet steel, and the paneling of steel plates japanned. The crew are berthed in the fore part of the ship, mess accommodation being provided for the whole ship's company at one sitting. Thirteen boats will be carried by the new battleship, which will include two torpedo vidette boats of British Admiralty type, 56 feet long, fitted with Thames Ironworks water-tube boilers; these boats will carry two fish torpedoes each in dropping gear, and a 2½ pounder Hotchkiss gun in the bow.



Mississippi River Steamer, Kate Adams, Built by Capt. Ed. Howard, Jeffersonville, Ind., for the Memphis & Arkansas City Packet Co.

INNOVATION IN RIVER STEAMERS.

THE KATE ADAMS, RECENTLY BUILT BY CAPT. ED. HOWARD, OF JEFFERSONVILLE, IND.—FIRST STEEL HULL SIDE-WHEEL PACKET CONSTRUCTED ON WESTERN RIVERS.

Probably the most notable vessel built during the past year in the ship yards of the Ohio and Mississippi rivers is the steamer Kate Adams, completed some weeks since by Capt. Ed Howard of Jeffersonville, Ind., for the Memphis & Arkansas City Packet Co. of Memphis, Tenn. It is more than probable that construction of the Adams will mark a new era in ship building on the rivers. She is the first steel hull sidewheel packet boat built for passenger and freight service on the rivers. As strength has been sacrificed in large wooden steamers of the river type to secure lightness of draught, particular attention has been directed to the results obtained from the adoption of steel for this hull. When this boat went into commission with complete outfit on board, her draught was only 3 feet 3 inches, whereas two boats having wooden hulls, built at the same yard, of the same general dimensions, and exactly the same engine and boiler power each showed under similar conditions a draught of 4 feet 4 inches.

The Kate Adams is 240 feet long, 40 feet beam, 7 feet depth of hold and 5 feet sheer. She has three fore-and-aft and five athwartship watertight bulkheads. Hull plating on the bottom and sides is of 5-16 inch steel; knuckle plating, ⅜ inch, stern band, 2 by 9 inches; stern post, 2½ by 7 inches; deck plank sheer stringers, 5-16 by 24 inches; transom 5-16 inch; floor frames, 6 inch Z bars; top frames, 3 by 5 by ⅜ inches; also steel cylinder frames and steel deck under boilers, coal bunkers and pumps. The entire hull is double riveted, the cavils, bitts and knees being of iron and steel.

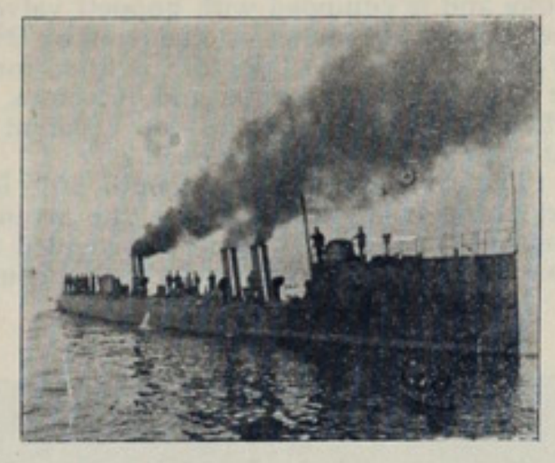
The engine is of 24 inches diameter of cylinder by 8 feet 9 inches stroke and is equipped with poppett valves. Steam is supplied from four steel boilers, 48 inches in diameter by 28 feet in length, each containing six 10-inch flues. A "doctor" is fitted for supplying the boilers and there are also auxiliary pumps and injectors, an auxiliary boiler for electric light and heating purposes and a patent steam filter for filtering all the water used on board the vessel.

The cabin is 200 feet in length, 15½ feet wide and 12 feet high, and in everything from decoration to the arrangement of the staterooms is thoroughly modern. There is provided an auxiliary cabin for colored passengers. The vessel is lighted throughout by electricity and heated by steam. This steamer was built with particular regard to the requirements for carrying the United States mail between Memphis, Tenn., and Arkansas City, Ark. The capacity of the boat is 600 tons. About 4,000 bales of cotton can be put aboard without inconvenience. She makes two trips per week, the average distance traveled each week being 1,000 miles, and on an average more than 180 landings are made each week. Specifications complete for this steamer were prepared by the James Rees & Sons Co. of Pittsburg, who furnished the machinery. She was built under the direct supervision of Capt. James H. Rees, president of the Memphis & Arkansas City Packet Co., at the Howard yard at Jeffersonville, and cost about $90,000. Capt. J. F. Ellison of Cincinnati, superintendent of the Pittsburg & Cincinnati Packet Line, who is heavily interested in the Memphis & Arkansas City company, purchased the outfit for the vessel, and it is due in a great measure to his good taste that the cabin of the Adams enjoys the distinction of being the finest ever seen on a river steamboat.

One of the features of equipment most worthy of note is the electric plant installed by the Triumph Electric Co. of Cincinnati. Current is furnished from a powerful generator direct connected with a Sturtevant double cylinder engine—the first of these engines installed on a Western river steamer. Indeed the plant is the most modern of any known to the vessels engaged in inland navigation. It consists of 350 incandescent lamps, five 2,000 candle power arc lamps and a search light of 4,000 candle power. In every detail it is an exact duplicate of the plant on Howard Gould's new steam yacht Niagara. The Kate Adams is officered as follows: M. R. Cheek, captain, Louis Botto, first engineer; John Botto, second engineer; first mate, Mr. Bender of Memphis; second mate, Z. T. Whipple of Louisville; Al Dickson, steward, and Alex Pritchard, clerk.

OUR LATEST TORPEDO BOAT.

THE ROWAN, JUST COMPLETED BY THE MORAN BROS. CO. OF SEATTLE, WASH—ONE OF THE THREE 185-TON, TWENTY-SIX KNOT BOATS AUTHORIZED BY THE ACT OF 1895.



The latest vessel of the United States torpedo boat flotilla to arrive at the stage of completion is the Rowan, which is now ready for trial at the yard of the Moran Bros. Co., Seattle, Wash. In view of the marvelous records made by the torpedo boats Farragut, built by the Union Iron Works, San Francisco, and the Davis, built by Wolff & Zwicker, Portland, Ore., both of which exceeded their contract speed, the record of this third product of a Pacific coast ship building institution will be awaited with interest.

The Rowan is one of the three torpedo boats for which provision was made by the act of June 30, 1895, the stipulation being that the boats must not exceed in cost $175,000 each. The navy department in asking for bids on these boats requested proposals under two classes—in accordance with plans and specifications provided by the secretary of the navy and in accordance with plans provided by the bidders. The Union Iron Works, Wolff & Zwicker, the Moran Bros. Co. and the Herreshoff Manufacturing Co. were the bidders, and the Moran company was awarded a contract under the specifications of the first class, while the other two went under the second class to the Herreshoffs. At the time of the award the boats were the largest and swiftest torpedo boats ever projected in the country, but later, of course, three vessels with a projected speed of 30 knots were designed.

The Rowan is 175 feet over all, 170 feet load water line, 17 feet beam, 5 feet 6 inches normal draught, 185 tons displacement, 11 feet freeboard, forward, 5 feet freeboard amidships and aft. Twin screws are driven by vertical inverted cylinder, direct acting, triple expansion engines of 3,200 indicated horse power, making 395 revolutions per minute and designed to give the vessel a speed of 26 knots. The boilers, three in number, are of the Mosher patent type. They have a total grate surface of 143 feet and a total heating surface of 7,890 square feet, or at a ratio of 1 to 55, and are designed to supply steam at a pressure of 250 pounds. Each boiler contains 1,302 tubes.

The hull is of steel throughout, the main portions below the water line being galvanized, and is divided into twenty-six water tight compartments by transverse fore and aft bulkheads. There are two conning towers, one forward at the break of the forecastle and the other aft. Steam steering apparatus is operated from the forward conning tower. One light mast for signalling purposes is fitted, and the boat carries two Schermerhorn folding boats handled by a light crane which serves also to handle the torpedos.

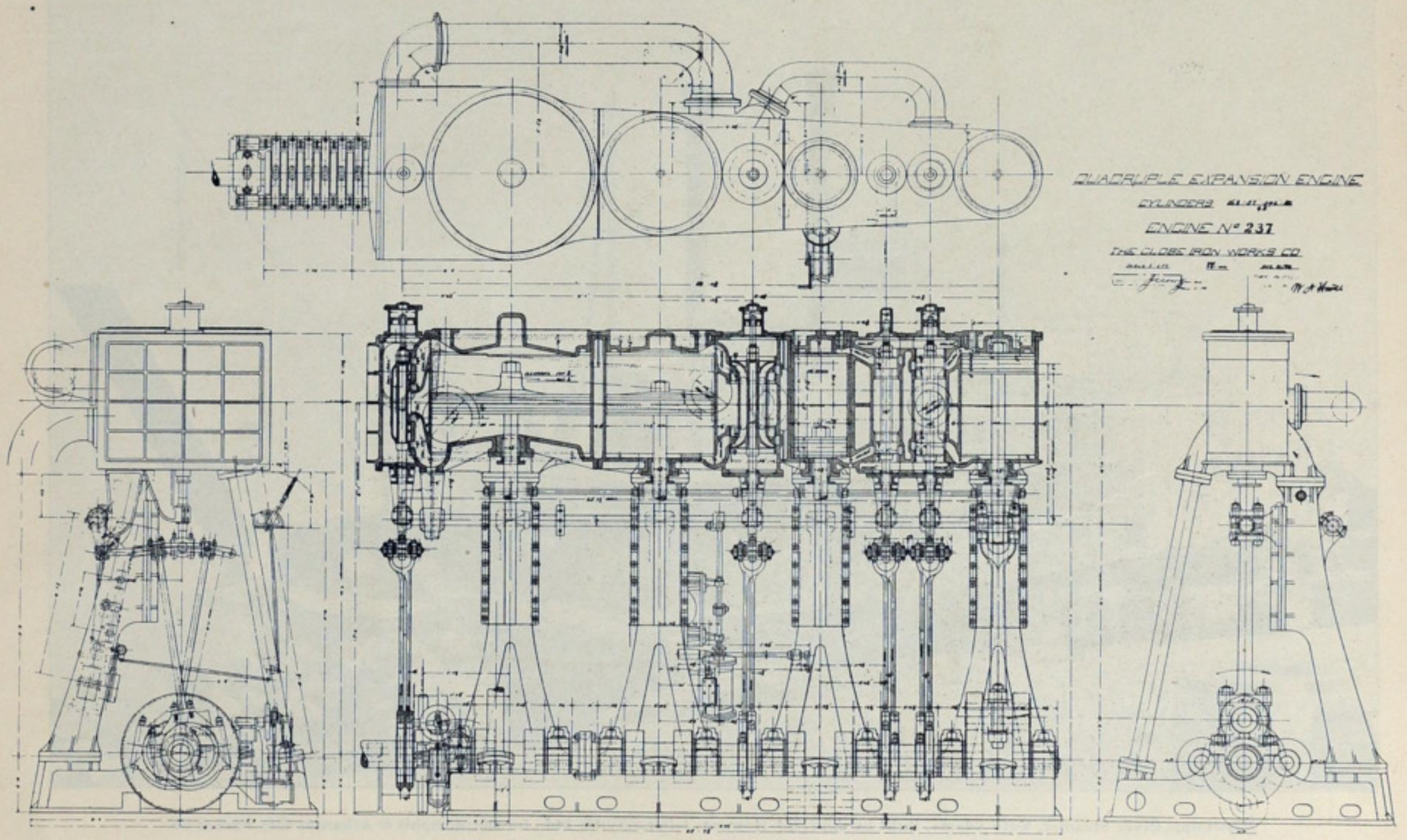
LARGEST STEAMERS OF THE GREAT LAKES.

THE SAMUEL F. B. MORSE AND A SISTER SHIP, BUILDING AT THE WORKS OF THE GLOBE COMPANY, CLEVELAND—VESSELS IN WHICH THERE IS NO SPARING OF MATERIAL.

The Globe Iron Works Co. of Cleveland, has had under construction for some time past for the Bessemer Steamship Co. (Rockefeller fleet) a freight steamer that is to be a duplicate of the Samuel F. B. Morse, built last winter at the works of F. W. Wheeler & Co., West Bay City, Mich. The Morse is the largest steamship on the lakes. Although built at the works of Wheeler & Co., Mr. R. L. Newman of the Globe company has been given credit for features of great strength in the Morse that seem to have proven especially satisfactory to the management of the Bessemer company. This was one reason why the contract for a duplicate vessel was given to the Globe works. It is generally understood that the Morse has not proven a large carrier, if compared with other vessels built recently on the lakes that are not her equal in dimensions. She carried on safe Lake Superior draught just 6,000 gross tons. It is not expected that the duplicate steamer now building in Cleveland, will do a great deal more than her predecessor, but the answer of both the builders and the management of the Bessemer company to criticism on this score is that the ship carried all they had expected of her, in view of the strength required by all parts of the design, and in view also of the fact that she was built with the intention of eventually towing two of the monster steel barges—7,000 gross ton type—that have come into use on the lakes.

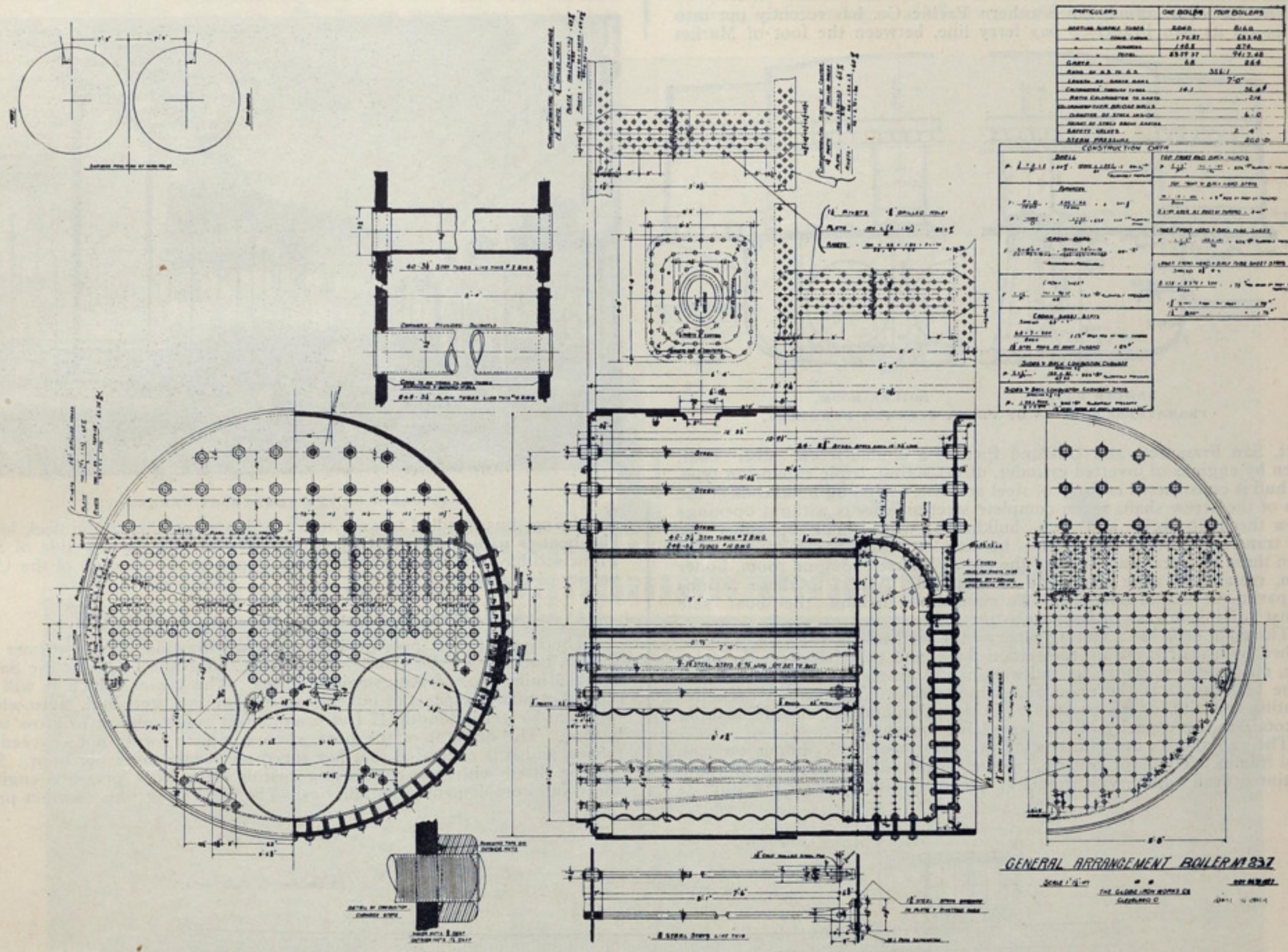
Referring to the plans of the second steamer building at the works of the Globe company, Mr. R. L. Newman, general manager of that company, said: "If at the end of next season this steamer should bring down the lakes two large steel barges, moving in all three vessels 20,000 gross tons, there would be another side to the criticisms regarding this kind of ship and the question of economy in the transportation of an immense quantity of ore. This steamer, running alone, can readily maintain a speed of about 15 miles an hour, and she will tow two big consorts when conditions can be arranged for handling such a tow, at a speed of about 11 miles an hour. The Review has already published illustrations dealing with the equivalent girder of these vessels, an examination of which will show that there are no vessels afloat on the lakes that will even approximate them in strength. Great care has been taken in the design, and quite a number of departures made from the usual practice. The object has been to so distribute the material that the neutral axis is considerably higher than those of similar ships, with the result that the fibre stress in the top member has been considerably reduced. The result has been, as illustrated in the operation of the Morse, that under any condition, either of load or speed, there is an entire absence of vibration, which is so perceptible in most of our long modern lake freighters. It is pleasing to note that notwithstanding the early criticism of this design, many of the vessels building at present are being constructed with a view to satisfying the conditions required for these long ships, but up to date none have advanced to the degree of stability represented by these two steamers."

A general view of the Morse, which is, of course, representative of the steamer now building, will be found in the Review of Sept. 22, 1898. Illustrations made from drawings of the engines are presented herewith. Dimensions of hull are 476 feet over all, 456 feet keel, 50 feet moulded beam and 29 feet moulded depth. Engines are of the quadruple expan-



Quadruple Expansion Engines of Largest Lake Steamer, Building at the Yard of the Globe Iron Works Co., Cleveland, O.

sion type, having cylinders 26½, 37, 54½ and 80 inches diameter, with a common stroke of 42 inches, and it is expected that they will indicate about 3,000 horse power on from 80 to 85 revolutions. The high pressure cylinder is driven by a plain plug piston valve, the first intermediate by the ordinary piston valve, the second intermediate by a piston Trick valve, and the low pressure by the ordinary double-ported slide valve. All of the engine forgings are of high-grade steel, and the crank shaft, thrust shaft and tail shaft are of hollow forged steel, made by the Bethlehem Iron Co. of So. Bethlehem, Pa., under what is known as the Whitworth fluid compressed system, and this shafting, before leaving their works, is all oil tempered. The propeller is 15 feet in diameter and 16 feet pitch, and made of cast steel. The bed plate is of cast iron, made in one piece, and weighs about 24 tons. There are four Scotch boilers, 13 feet 4 inches mean diameter, and 11 feet 8⅛ inches over tube sheets, each boiler being fitted with three Morrison suspension furnaces, and the whole designed for a working pressure of 200 pounds per square inch. Each boiler is also fitted with a Learmonth purifier. The total grate surface in the four boilers is 264 square feet, and the total heating surface 9,417 square feet; ratio of heating surface to grate surface, 35.6 to 1. Tops of the combustion chambers are made circular, with plate attachments for staying the back head. This obviates the necessity of using crown girders and studs.



Arrangement of Boilers in the Largest Steamer of the Great Lakes, Building by Globe Iron Works Co., Cleveland, for Bessemer Steamship Co., (Rockefeller Fleet.)

The Truscott Boat Manufacturing Co., St. Joseph, Mich., manufacturers of vapor marine motors and high grade pleasure craft are enthusiastic over the outlook for business. In a letter to the Review they say: "We have reason to believe that next season's business will be the best in the history of small launch building. We are at present and have been for some time past working a good force of men, and are putting on more at the rate of several every day. We have on our books orders for over twenty-five launches, in sizes ranging from 16 feet to 50 feet in length, which we will ship to all parts of the world, and which are almost exclusively for pleasure purposes. We are also working on a line of stock boats. The excellent outlook for next year's business has been sufficient to warrant our making extensive additions to our plant. In fact we have added three buildings."

The Daimler Manufacturing Co. of Long Island City, N. Y., is building the following craft: A 50-foot $7,000 auxiliary yacht for L. O. Schwencke of New York City; 18-foot $800 launch for William E. Glucek of Brooklyn; 26-foot, $1,300 launch for N. A. Pendleton of Stonington, Conn.; 21-foot, $900 launch for the Mexican Trading & Coffee Co. of Mexico City, Mexico; 33-foot, $2,000 launch for Commodore L. R. Brooks of Minneapolis, Minn.; 18-foot, $800 launch for James Kaine of Brooklyn; 38-foot, $4,000 launch for W. W. Curry of Miami, Fla. These vessels are equipped with Daimler motors, ranging from 1 to 25 indicated horse power.

NEWEST AMERICAN SHIP YARD.

The Review appropriately presents as one of the supplements to this edition a group of scenes at the ship yard of the W. R. Trigg Co., Richmond, Va.—America's newest ship building plant. Eight months ago this plant was one of the remotest of possibilities. When Mr. W. R. Trigg, president of the Richmond Locomotive Works, Richmond, Va., submitted in his own name bids for torpedo boats and destroyers under the authorization of the act of May 4, 1898, even he was far from sanguine of securing even a single contract. When the award was made, contracts for three torpedo boats and two destroyers were awarded to him. Then Mr. Trigg set to work with an energy worthy of the cause. The W. R. Trigg Co. was organized and the stock subscribed almost in a single evening. The old Talbott works was leased and the work of converting it into a machine shop begun, while a large force of workmen hurried the operation of driving piles for 600 feet of launching ways fronting on the James river. Even the municipal officials caught the enthusiasm and steps were at once taken to deepen the channel of the river.

Meanwhile competitors of the Trigg company, who had been unsuccessful in securing awards of contracts, raised with the navy department the question of the ability of the Richmond concern to fulfil the contracts as the stipulations stood with reference to time limitations. The department made an investigation, with the result that the contracts were ratified and the Trigg company assigned the torpedo boats Shubrick, Stockton and Thornton and the destroyers Dale and Decatur. But the prime movers in the new enterprise had not relaxed their energy, and the consequence was that they were enabled to lay down the boats in the mold loft almost as soon as any of the longer established firms. The Trigg Co. has up to this time, of course, devoted all its attention to the naval contracts in hand, but it is also a tribute to the reputation and ability of the men behind the enterprise that contracts for mercantile tonnage are already in sight. Mr. Trigg is president of the company, Lilburn T. Myers, vice president, and W. C. Preston, secretary. The general offices, which were at first established at Room 10, Chamber of Commerce building, have been removed to 1521 East Cary street.

P. L. Colon, whose Claremont steam marine railway and ship building yard is located at the foot of Philip street, Jersey City, N. J., has just completed three scows, each 116 feet long, 33 feet wide and 12 feet deep for the Interstate Dredging Co., and three deck scows, each 120 feet long, 37 feet wide and 12 feet deep, for Brown & Fleming. Prices on the former were $9,000 each and on the latter $6,000 each.

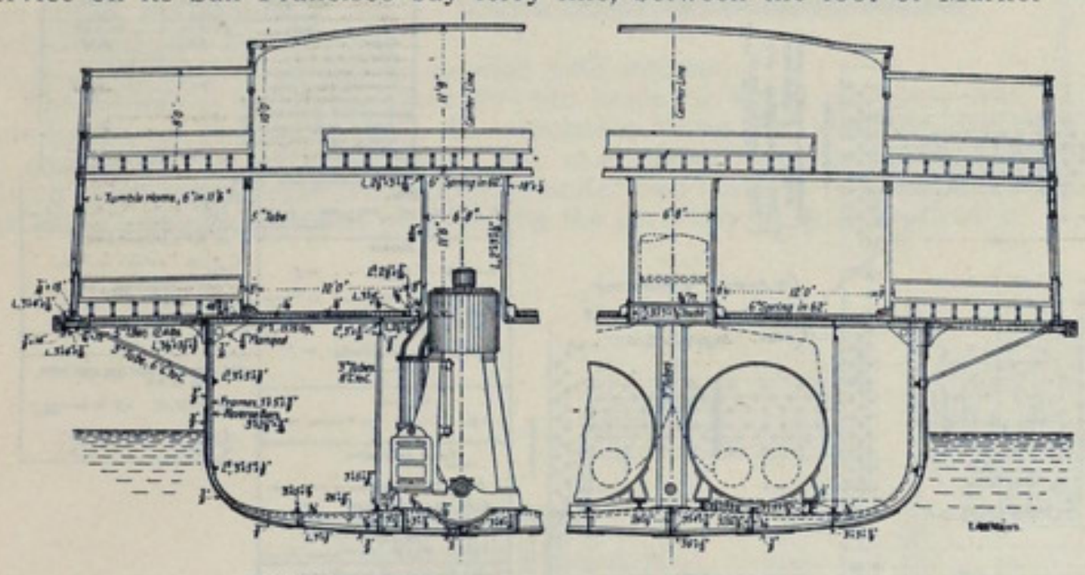
The Cape Cod Yacht Agency at Barnstable, Mass., is building six 20-foot catboats, all from one design, for a Barnstable summer resident. The agency management has just about closed contracts for a 21-foot raceabout for Boston parties and a 30-foot cruising yawl for a New Yorker.

FERRY BOAT BERKELEY.

ONE OF THE LARGEST VESSELS OF ITS CLASS IN THE WORLD, JUST COMPLETED BY THE UNION IRON WORKS, SAN FRANCISCO, FOR THE SOUTHERN PACIFIC CO.

The Union Iron Works, San Francisco, has seemingly made a reputation for the construction of every type of vessel which it ever essayed to build, and there is an absolute certainty that this truism will obtain with equal force in the case of ferryboats in view of its most recent achievment in this line, namely, the construction of the Berkeley for the Southern Pacific Co. The preparation of plans was undertaken only after a thorough study of the designs of ferry boats in the service of the Pennsylvania and other eastern railroads, and as a result the San Francisco firm has been enabled to turn out a boat that is not ony quite the equal of any of these vessels in size and accommodation, but is one of the largest and handsomest passenger ferry-boats in the world. The fact that the main cabin is the largest in the world has added to the attention which has been attracted to the vessel.

The Berkeley, which the Southern Pacific Co. has recently put into service on its San Francisco bay ferry line, between the foot of Market



ENGINE ROOM. BOILER ROOM.
TRANSVERSE SECTION OF FERRY STEAMER BERKELEY.

street, San Francisco, and Oakland Pier, is a double-screw steel boat, driven by engines of inverted cylinder, direct acting, triple expansion type. The hull is constructed entirely of steel and has, including bulkheads at the ends of the screw shaft, seven complete steel bulkheads without openings below the main deck, and two bulkheads with small openings for the transfer of coal from the bunkers to the boiler room. Between these bulkheads are located the crew's quarters, engine room, boiler room, restaurant, wine room and toilet room. Access to these various compartments is had only from the main deck, making the boat safe against sinking in case of damage to the hull.

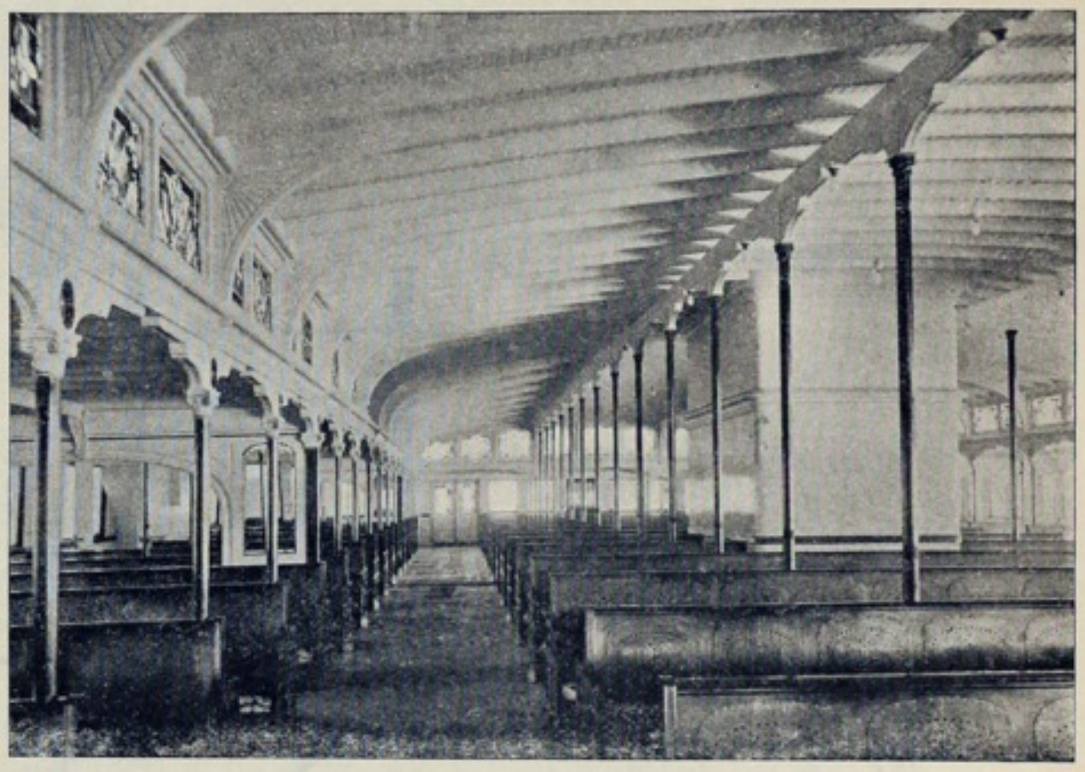
The main deck has a seating capacity for 580 passengers; a toilet room, reached by a stairway from the saloon deck, and two driveways for baggage, mail and express trucks and wagons. A single stairway at each end of the boat connects the main and saloon decks. The saloon deck has a seating capacity for 997 passengers in the cabin and 132 outside, making the total seating capacity of the boat 1,709 passengers.

The cabin seats are constructed of perforated black walnut on teak wood frames. The floor covering is interlocked rubber tiling. The cabin is painted dead white, with gold leaf ornamentation. The clear story is glazed with art glass. Ventilation and heating is provided for by the plenum process, pipes being provided for the inlet of fresh air and the efflux of vitiated air. The boat is lighted throughout by electricity.

The rudders of the boat are operated by steam steering gear. A special feature of this boat is its numerous large windows, glazed with plate glass and set at such height from the decks that an unobstructed view of the Bay of San Francisco can be had from all the seats. Under ordinary running conditions, the trip between San Francisco and Oakland Pier (4½ miles) is made in 17½ minutes. The principal dimensions, etc., are as follows:

Seating capacity	1709
Length over all,	289 ft.
Length inside rudder posts,	260 ft.
Beam moulded,	40 ft.
Beam over wood guard,	64 ft.
Depth, moulded, at guard,	16 ft. 6 in.
Depth, moulded, at center,	17 ft.
Depth of hold,	14 ft. 10 in.
Draft, extreme load,	8 ft. 6 in.
Number of propellers,	Two (one at each end).
Diameter of propellers,	8 ft.
Registered tonnage,	Gross, 1,945 tons
	Net 1,245 tons.
Type of boilers,	Scotch cylindrical.
Horse power,	1,450
Boiler pressure,	165 lbs.
Number of cylinders,	3
High pressure cylinder, diameter	23 in.
Stroke,	36 in.
Intermediate cylinder, diameter,	34 in.
Stroke,	36 in.
Low pressure cylinder, diameter,	56 in.
Stroke,	36 in.
Revolutions of screw per minute,	125

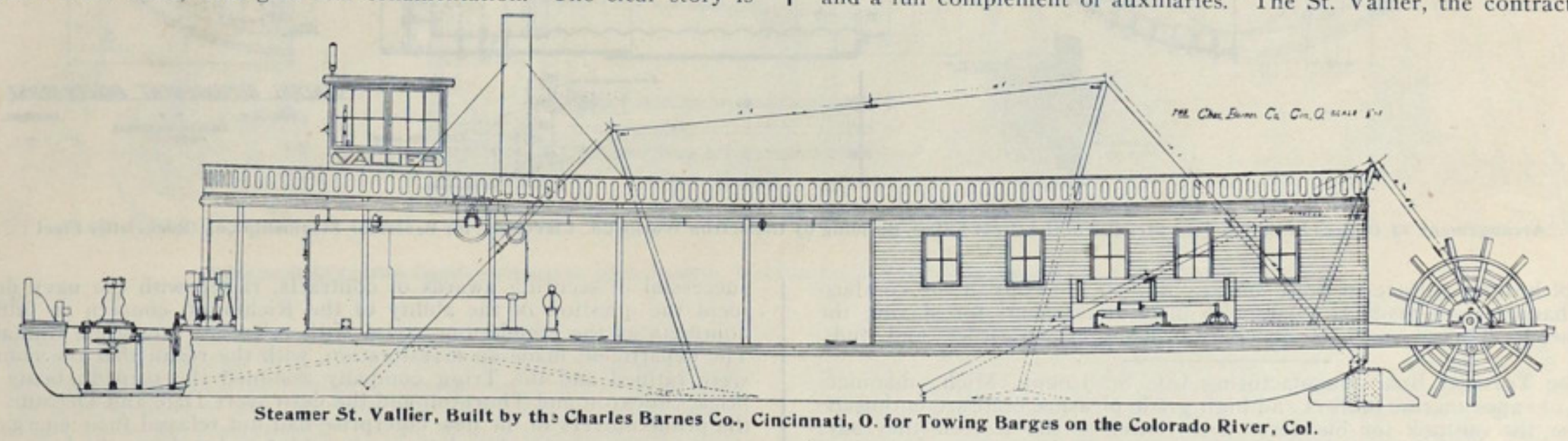
Second story (or upper deck) landings are provided and used at both San Francisco and Oakland Pier depots, a large proportion of the passengers being thus handled to and from the depots on the saloon deck level. The boat is named for the City of Berkeley on the easterly side of San Francisco bay, and noted among other things as the location of the University of California.



MAIN CABIN OF THE FERRYBOAT BERKELEY.

STEAMER FOR COLORADO RIVER SERVICE.

There is herewith presented an outboard drawing of the steamer St. Vallier, building by the Charles Barnes Co., Cincinnati, O., for the Santa Anna Mining Co. of Kingsman, Arizona. The vessel, which it will be seen is in many respects of novel construction, is a steel-hull, stern-wheel tow boat 75 feet in length, 17 feet beam, 3 feet depth, and of 75 gross tons burden. The draught of the boat when complete will not exceed 12 inches, and it is estimated that her speed will be 10 miles per hour. She will be fitted with non-condensing piston valve high pressure engines and a full complement of auxiliaries. The St. Vallier, the contract price for which is $15,000, is designed for towing barges on the Colorado river, and it will be noticed that she has a powerfully geared capstan at her head that will assist in propelling the boat through some of the rapids which will be encountered on the route on which she is to be in service. The vessel is being constructed at the Barnes plant at Cincinnati, but will be taken apart shipped by rail and reconstructed on the banks of the Colorado river.



Steamer St. Vallier, Built by the Charles Barnes Co., Cincinnati, O. for Towing Barges on the Colorado River, Col.

The American platemakers are turning the tables on us in the matter of steel plates, and soon one may expect to see our enterprising contemporaries in America publishing illustrations of the first ship built in the old country entirely of American produced materials.—London Shipping World.

It is understood that the Cramps are making arrangements to build at Philadelphia a fully equipped dry dock, 700 feet in length. An effort will be made to locate the dry dock as near to the ship yard as possible.

NEWPORT NEWS GIVEN FIRST PLACE.

ONE OF THE ENGLISH SHIPPING JOURNALS, SUMMARIZING THE OUTPUT OF LEADING SHIP BUILDERS OF THE WORLD IN 1898, PLACES THE AMERICAN YARD AT THE HEAD OF THE LIST—THE ERROR CAUSES A STIR IN SHIP BUILDING CIRCLES.

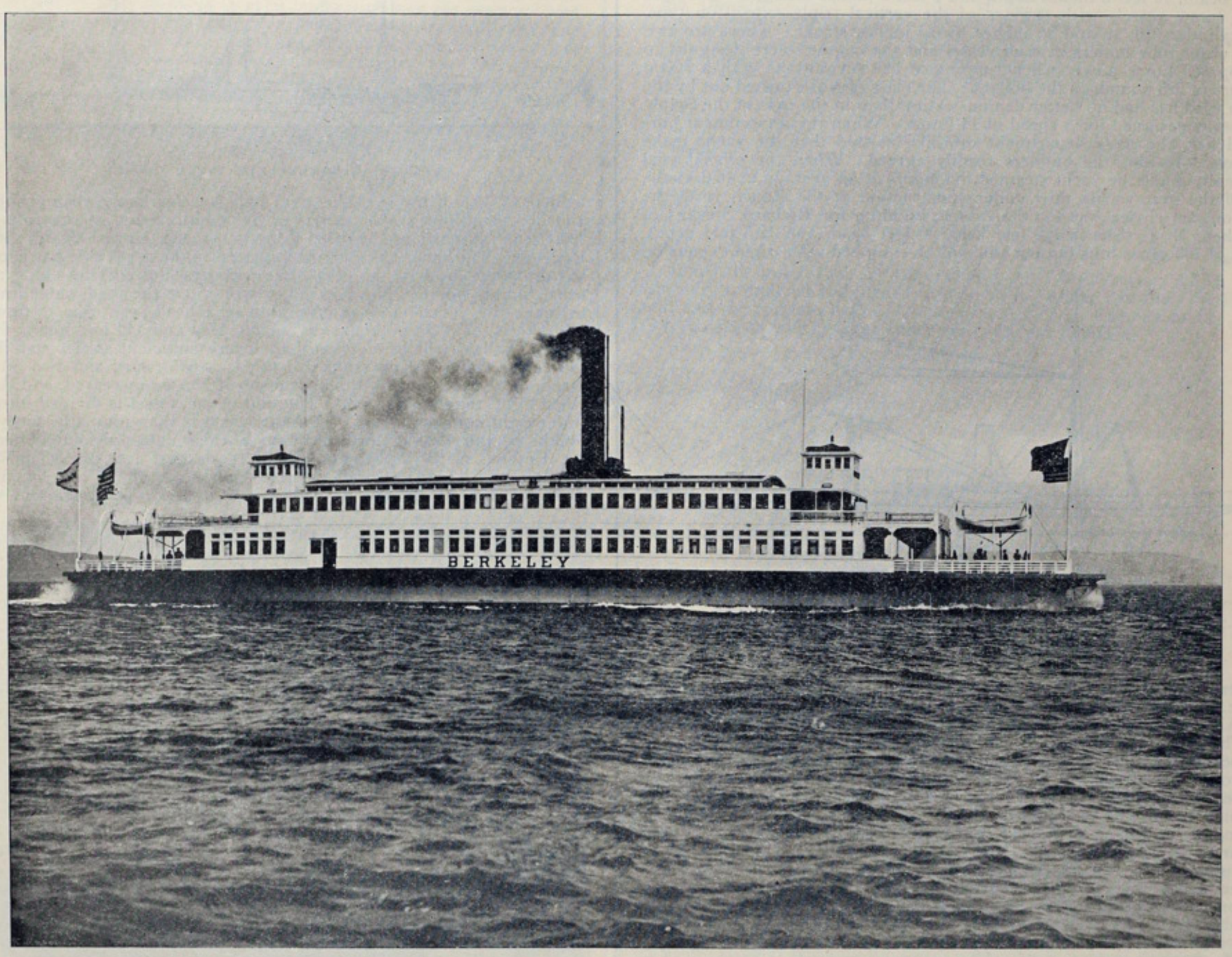
Among foreign and particularly British ship builders great importance is attached to the relative positions occupied by firms with reference to the largest output of tonnage. The builders on the other side of the water were therefore pretty thoroughly surprised when tables for 1898—prepared by one of the English shipping journals—was found to accord the place of honor to the Newport News Ship Building & Dry Dock Co. of Newport News, Va. It was the first time in history that the record output of a year was accredited to an American ship building institution.

In simple justice, however, it must be admitted that this assignment is incorrect. The Newport News yard is accredited with an output of 80,225 tons during the year, whereas the figures represent not the output of the yard but the tonnage under contract, as will be seen from the table presented elsewhere in this issue. The English statisticians included as output the battleships Kearsarge, Kentucky and Illinois, which have been launched but not completed, and other vessels that are by no means a part of the year's output, such as the battleship Missouri and the monitor Arkansas, upon which work was begun only a short time ago.

In the table sent out from London the output of leading ship building firms of Great Britain and Ireland for 1898 is given as follows: Sir Wm. Gray & Co., 72,723 tons; C. S. Swan & Hunter, 68,696 tons; Harland & Wolff, 67,905 tons; Armstrong, Whitworth & Co., 53,979 tons; Workman, Clark & Co., 53,475 tons; Russell & Co., 44,551 tons; Ropner & Son, 43,647 tons; Palmer Ship Building & Iron Co., 41,824 tons; J. L. Thompson & Sons, 41,056 tons. The largest output of any one yard in Germany, that of Blohm & Voss, is given as 42,337 tons.

Whatever be said of its incorrectness, this report as to the operations of the Newport News company has served to stir British ship building circles as nothing ever did before to a realization of what is to be feared from American competition. In discussing the subject the Shipping World of London in a recent issue said: "We know—leastwise we feel that in America alone are to be found the men who can make competition serious. It is true that by reasons of climate and the cost of labor Americans are disadvantaged in the race with us. But on the other hand, the cost of inland transportation is lower in America than in this country; and they are more ready to adopt new inventions, machine tools, and labor-saving appliances than are our manufacturers. That point was well put by an American during the great dispute in the engineering trade which was settled after many months of conflict last January. A Scotch engineer told the visitor that he 'could not afford' to supersede his old machinery by new types: 'And we,' replied the American, 'cannot afford not to make the change.'

"We have dealt at this considerable length with a country whose present output and apparent competitive powers are the least important and deserving of consideration. But the American is the only rival who need occasion anxiety to us. What takes place on the continent is under our very eyes. The Germans are, of course, the keenest and most prosperous of our competitors. For size and speed they occasionally pass us, but there is no striking feature of difference between their hulls and engines and ours. In one important respect they are better off than we are. The cost of labor is less in Germany than it is with us; the discipline—the obedience of man to master—is more uniformly observed there than here. And the carriage of raw and manufactured materials—of coal, iron, plates, timber, engines, everything—is cheaper. Their yards are in most cases new in a comparative sense. Their machinery is, taking all the yards, superior to ours. On the other hand, they are less acute, less enterprising than either the Americans or ourselves. Moreover, the compulsory military service both in Germany and in France tells heavily against the skill and general efficiency of their engineers and shipwrights."



Ferryboat Berkeley, Built by the Union Iron Works, San Francisco, for the Southern Pacific Co.

NAVAL BILL DELAYED.

Washington, D. C., Jan. 11—The naval appropriation bill has for some reason, unknown even to members of the naval affairs committee, been withheld from congress for several days past, although it is claimed that a majority of the committee are in favor of reporting the bill as already agreed upon. Some time ago Senator Hanna announced suddenly that there was nothing to be gained by making appropriations at this time for more naval vessels, on account of the crowded condition of the ship yards. Now it is said that the administration policy is to defer naval appropriations, in order to hold down the aggregate of expenditures, on account of the attention that will be directed to the large appropriations that must follow such measures as the Nicaragua canal bill and the shipping bill.

The naval bill as agreed upon in committee provides for three 13,000-ton battleships, three armored cruisers of the same size, three protected cruisers of 6,000 tons, six protected cruisers of 2,500 tons and an enlisted force of 20,000 men.

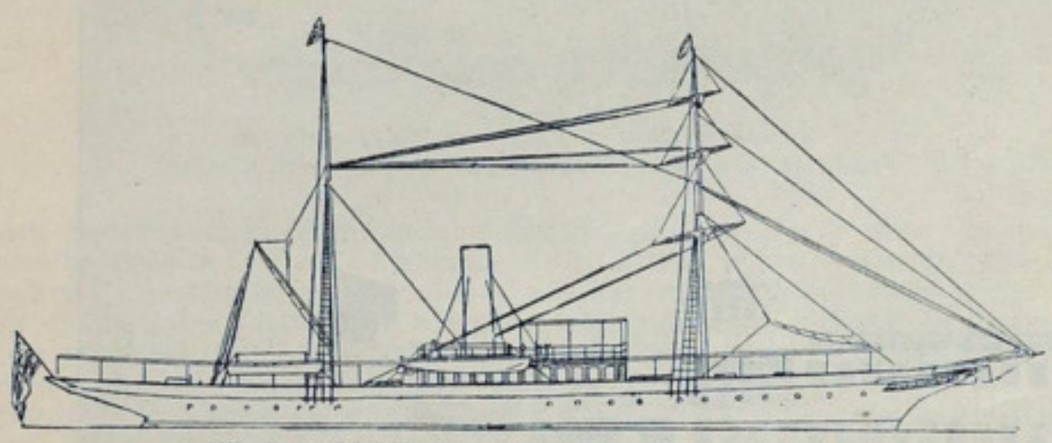
A visit to the National Capital may be enjoyed without extra cost for fare in going to Philadelphia and New York over Pennsylvania short lines. Tickets to those points via Washington may be obtained at same fares as apply over Pennsylvania direct lines, and will be good for ten days' sojourn at the national capital. For particular information apply to Pennsylvania lines ticket agents or address C. L. Kimball, assistant general passenger agent, Cleveland.

YACHT BUILDING IN THE UNITED STATES.

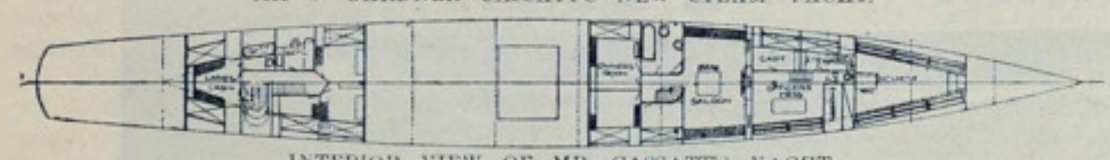
TWELVE STEAM PLEASURE CRAFT, AGGREGATING IN VALUE $3,000,000, BUILDING AT ATLANTIC COAST SHIP YARDS—A RECORD WITHOUT A PARALLEL, DUE, IN PART, TO THE WAR.

The recent war with Spain was only one of a number of factors that have contributed to a wonderful degree of activity in steam yacht building in America. There are now under construction in the ship yards along the eastern coast of the United States a total of twelve steam yachts, valued in the aggregate at about $3,000,000. The war with Spain was a contributing factor in that a number of yacht owners—some of whom had long desired new boats—were enabled to sell their vessels to the government at good prices and an immediate placing of orders for new pleasure craft followed. The Roach ship yard (Delaware River Iron Ship Building & Engine Works) of Chester, Pa., was most fortunate in securing contracts for the new yachts. This was due in part, no doubt, to the excellent testimonial to their work constituted by the president's yacht Sylph and her sister boat the Malay, owned by Dr. Weld of Boston, which had been turned out early in the year. These vessels are 152 feet extreme length, 20 feet beam, 10 feet 6 inches depth and 8 feet 9 inches draught. They are single screw vessels with engines of the vertical triple expansion type, with cylinders 10, 16 and 25 inches by 16 inches stroke. There are two Almy water tube boilers in each vessel and the engines were designed to develop 550 horse power when running at 320 revolutions with a steam pressure of 225 pounds in the boilers. The class of work turned out by the Roach yard has had no better demonstration than in the case of the Sylph, which was designed for a speed of 14 knots. When the government purchased her, the navy department officials insisted that the yacht make 15 knots. To this the builders readily agreed. When the official trial was finally made the yacht steamed five hours at an average of 16.2 knots.

Of the four yachts now under construction at the Roach yard, the first contract closed was for the Aileen, building for Richard Stevens of Hoboken, N. J. She is 122 feet keel, 20 feet beam and 12.6 feet depth. She is of 160 gross tons burden and will be equipped with triple expansion



MR J GARDNER CASSATT'S NEW STEAM YACHT.



INTERIOR VIEW OF MR CASSATT'S YACHT

engines, with cylinders 10, 16 and 25 inches in diameter by 16 inches stroke, to which steam will be supplied from two Almy water tube boilers. The Aileen will cost in the neighborhood of $60,000.

The yacht, not yet named, building for Eugene Tompkins of Boston, will be 140 feet keel, 20 feet beam, 12.6 feet depth and of 180 tons. She will cost $75,000 and will be fitted with four-cylinder triple expansion engines, with cylinders 12½, 20, 22½ and 22½ inches by 18 inches stroke, to which steam will be supplied from four Almy boilers. The yacht building at the Roach yard for J. Gardner Cassatt of Philadelphia is very similar to the Tompkins boat. The Cassatt yacht, which will be known as the Eugenia, will cost $80,000, and will be 140 feet keel, 21 feet beam and 13.9 feet depth. She will have a gross tonnage of 200, and power for propulsion will be furnished by triple expansion engines, with cylinders 12, 19 and 31 inches by 21 inches stroke, steam for which will be supplied by two water tube boilers of the Almy type.

The most expensive yacht under construction at the Chester yard is the $100,000 craft building for A. E. Tower of Poughkeepsie, N. Y., and which has not yet been named. This vessel, which is designed particularly with a view to Mediterranean service, will be 155 feet keel, 22.4 feet beam, 12.2 feet depth and of 220 tons burden. Her machinery equipment will consist of two triple expansion engines, with cylinders 12½, 20, 22½ and 22½ inches by 18 inches stroke and four Almy boilers. All four of these yachts, as well as the Sylph and Malay, were designed by Gardner & Cox, well known naval architects of 1 Broadway, New York City.

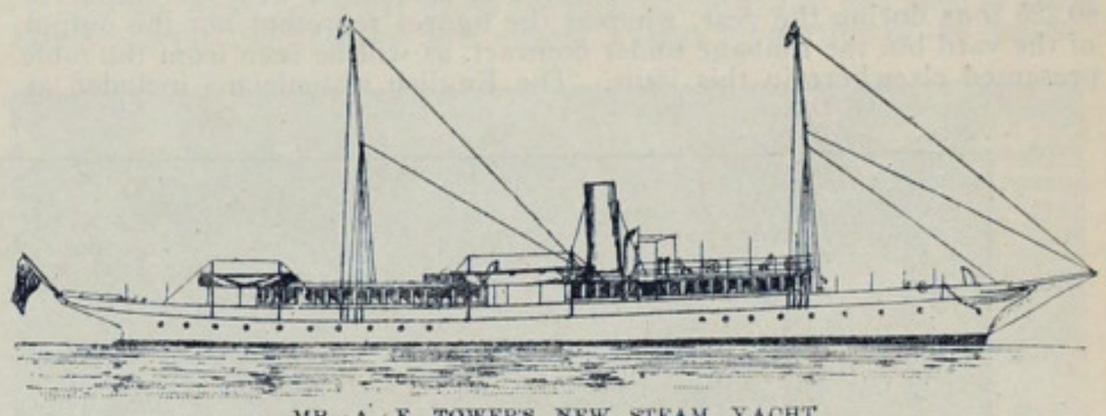
AT THE GAS ENGINE AND POWER CO.'S WORKS.

Another enterprising firm whose yard is now crowded with new steam yacht tonnage is the Gas Engine & Power Co. & Chas. L. Seabury & Co., Consolidated, of Morris Heights, N. Y. The most important of the yachts on the stocks at this yard, is a twin-screw steel vessel building for John P. Duncan of the New York Yacht Club and designed by Charles L. Seabury to replace the Kanawha, which Mr. Duncan sold to the government. She is 225 feet over all, 192 feet on the water line, 24 feet beam, 14 feet depth and 10 feet draught loaded. She will be equipped with two triple expansion engines, with cylinders 14, 23¾ and 43 inches in diameter by 24 inches stroke, to which steam will be supplied by four Seabury water tube boilers capable of a working pressure of 250 pounds and must maintain a speed of 20 miles.

A second large yacht for which the New York firm holds a contract is a composite vessel for Louis Bossert, of Brooklyn, N. Y. She will be 135 feet over all, 110 feet water line, 16 feet beam, 9 feet 6 inches depth and 6 feet 6 inches draught. The machinery installation will consist of Seabury triple expansion engines, with cylinders 8½, 14 and 23 inches by 12-inch stroke, and a boiler of the Seabury type, allowed 260 pounds working pressure. The most recent contract closed by the Gas Engine & Power Co. & Seabury & Co. is for the construction of a yacht to be known as the Aria and which will replace the Rex, owned by Edward H. Blake of Bangor, Me. Mr. Blake's new yacht will be 145 feet over all, 23 feet beam, 12 feet depth and of 200 tons burden. Power will be furnished by a triple expansion single-screw engine capable of driving the yacht at a speed of 16 knots. These builders also have a contract for a single-screw steel steam yacht of 150 feet length, the name of whose owner has not been made public.

COL. OLIVER H. PAYNE'S YACHT APHRODITE.

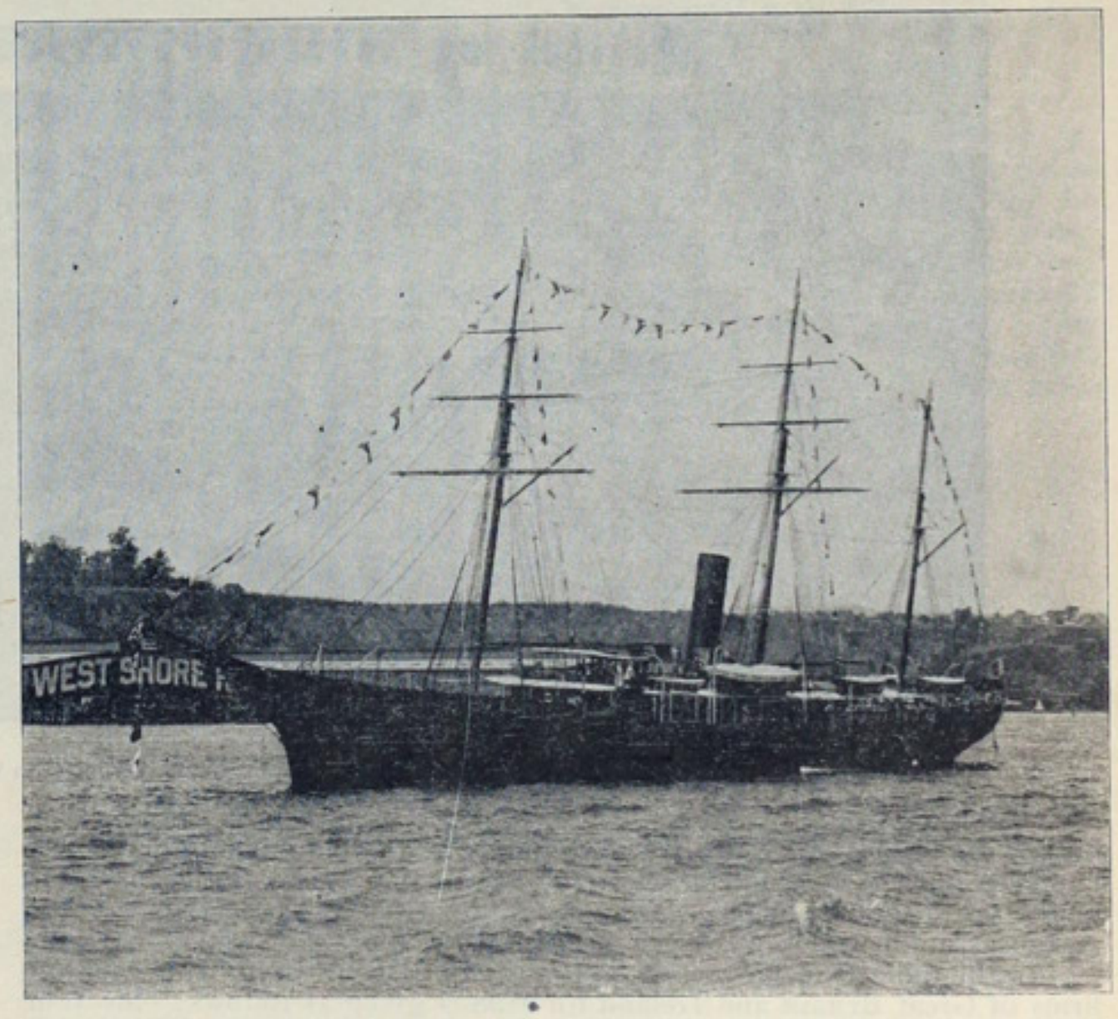
Great interest attaches at this time to the large steam yacht Aphrodite, building for Col. O. H. Payne and recently launched at the Bath Iron Works, Bath, Me., and which will be not only the largest and speediest steam yacht ever constructed in this country, but one of the finest pleasure craft afloat. The hull of the Aphrodite measures 303 feet over all, 260 feet between perpendiculars, 35 feet 6 inches beam, and she will draw when



MR A. E. TOWER'S NEW STEAM YACHT

loaded 16 feet of water. The steel hull is remarkably strong and rigid, and her scantlings are in excess of the requirements of the rules of the American Shipmasters, British Lloyds, or the United States Standard Register. The yacht has a flat keel instead of the usual side bar keel. She has moderate deadrise, an easy bilge with graceful curving sides, and the usual tumble home. The bow lines flare above the load water line so as to make the vessel more comfortable in a head sea. She is fitted with bilge keels, or rolling chocks, 24 inches deep and 140 feet long. No permanent ballast will be necessary to insure sufficient initial stability, but four large water ballast tanks are fitted, two forward and two aft of the machinery space, so that the displacement can be increased, and the trim, when light, regulated at will. The hull of the vessel is divided into fifteen water-tight compartments. There are no less than nine athwartship steel bulkheads and no doors are cut in any of them unless absolutely necessary.

Engines of the Aphrodite will be the largest ever placed on board a private-owned pleasure craft. The cylinders are 28, 43 and 70 inches in diameter respectively, and the stroke is 36 inches. There are four massive



HOWARD GOULD'S YACHT NIAGARA.

single-ended boilers. At natural draught these boilers will supply steam for 3,200 I. H. P. There is no yacht afloat today that is fitted with machinery capable of developing this power at natural draught. The speed of the Aphrodite under steam alone, without forcing, will be at least 15 knots, and this she will be able to maintain on a long run, owing to her great boiler power and large coal capacity. Under forced draught she will make over 17 knots.

THE NEW CORSAIR AND HOWARD GOULD'S NIAGARA.

The Payne yacht is only slightly smaller than the new steam yacht Corsair—the third of that name—building for J. Pierpont Morgan, which was recently launched at the Newburgh (N. Y.) yards of T. S. Marvel & Co. who were awarded the sub-contract for hull construction by the W. & A. Fletcher Co. of Hoboken, N. J., who have the contract for the vessel and are furnishing the engines and boilers. The Corsair is 302 feet over all, 252 feet water line, 30 feet beam, 20½ feet depth, and will have a draught of 14½ feet. The hull shows symmetrical lines, and above the water line the steel plates are

flush, and present a smooth and unbroken surface. The hull is fitted with bilge keels, 18 inches wide amidships, that run a trifle more than one-third of her entire length. This vessel will be equipped with two triple expansion engines of large power, driving twin screws, and steam will be furnished by two double-end Scotch boilers. There will be a complete electric plant in duplicate for lighting and other purposes and the vessel will carry three launches, one life boat, one gig and one cutter on davits.

A steam yacht that is thoroughly representative of the best American practice is the Niagara, which was delivered to Howard Gould during the past year by the Harlan & Hollingsworth Co. of Wilmington, Del., and a picture of which is herewith presented. Principal dimensions of the Niagara are as follows: Length over all, about 272 feet; length between perpendiculars (Lloyd's measurements) 247 feet 6 inches; breadth, molded 36 feet; depth to spar deck at sides, 27 feet 5 inches; depth to spar deck at center, 28 feet 2 inches; depth, molded, to main deck at center, 19 feet 6 inches; depth, molded, to main deck at side, 19 feet 4 inches.

The motive power consists of two surface condensing triple expansion inverted direct-acti g engines, each having cylinders of 18, 28 and 45 inches diameter, with 30 inches stroke, and supplied with steam by three steel Scotch boilers, each 13 feet 6 inches by 11 feet 6 inches in the clear. There are three 46-inch furnaces to each boiler and they are proportioned for a working pressure of 160 pounds of steam per square inch; also one donkey boiler of steel, Scotch type, 6 feet 10 inches diameter and 9 feet 2 inches long, with one 40-inch furnace, proportioned for 160 pounds steam. The indicated horse power at maximum speed is about 2,000. The speed designed with 400 tons of coal in bunkers (no water in water bottom but with all other weights on board) is 14 knots on a six-hours' trial running under natural draught. The full bunker capacity is 425 tons. The rig is a bark, square on fore and main mast.

A yacht which will cost in the neighborhood of $400,000 is under construction at the yard of the Neafie & Levy Ship & Engine Building Co., Philadelphia, for Mr. P. A. B. Widener of Philadelphia. This vessel, which is designed to replace the Josephine (now the auxiliary gun boat Vixen), which Mr. Widener sold to the government during the war, will be 257 feet over all, 216 feet on the water line, 30 feet 3 inches beam, 18 feet 6 inches from the base line to main deck beams and 26 feet 6 inches from base line to top of awning deck beams. Power will be supplied by a quadruple expansion engine, with cylinders 19½, 28, 39 and 57 inches diameter by 36-inch stroke, and which is expected to enable the yacht to attain a speed of 17 knots.

A yacht contract closed within the past few weeks was that signed by the John N. Robins Co. of the Erie Basin Dry Docks, New York, to build for D. Willis James and Arthur Curtiss James an auxiliary yacht 130 feet on the water line, 160 feet over all, 26 feet 9 inches beam and 14 feet draught. She will be equipped with triple expansion engines and two Almy water tube boilers, which will drive a two-bladed feathering screw propeller.

A distinctive feature of this activity in yacht building is the manifest inclination on the part of prospective yacht owners to place their contracts with American yards. Indeed the contract for A. J. Drexel's new craft, which was designed by Watson & Co., Glasgow, is the only commission placed with a foreign builder in some time.

Notwithstanding an increase in the capital stock to provide for building three new steamers, of which two have already been ordered, the Hamburg-South American Steam Navigation Co. will declare a dividend of 16 per cent for 1898, as against 12 per cent for the preceding year.

The Kensington Ship Building Works, Philadelphia, has secured the contract to build a floating quarantine station for the United States marine hospital service at Havana, Cuba. The craft will be 160 feet over all 32 feet beam and 12 feet 6 inches depth.

SHIP BUILDING AT BATH DURING 1898.

The decline in the demand for wooden tonnage threatened, not long ago, to result in the almost total annihilation of the ship building industry on the coast of Maine, which was at one time the great ship building district of the country. The day of the wooden ship has passed, but with the output of the Bath Iron Works in steel vessels, and with a general revival in wooden ship building lines, the New England district makes a very good showing for the past year. The improved conditions are indicated by the appended statement showing ship building operations for the year 1898, at Bath, the principal seat of the industry. The list is as follows:

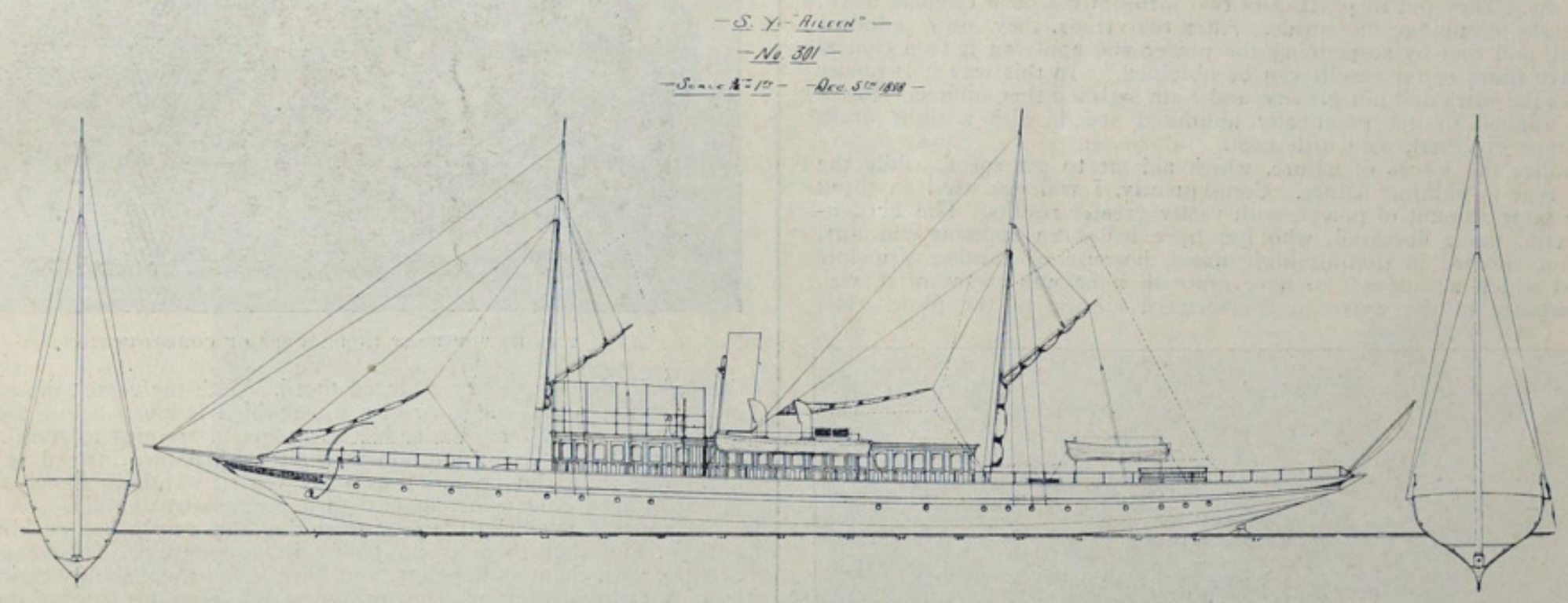
VESSELS BUILT AND DOCUMENTED IN THE DISTRICT OF BATH DURING THE YEAR 1898.

Type of Vessel.	Name.	By Whom Built.	Gross Tons.
Sch.	Alice E. Clark	Percy & Small	1621
Bge.	Warren	Kelley, Spear & Co.	283
Str.	Fay	Geo. W. Gross	25
Bge.	Fall River	Kelley, Spear & Co.	850
Bge.	A	Kelley, Spear & Co.	944
Bge.	Number Four	New England Co.	920
Slp.	Hope	Edwin M. Trott	12
Str.	Sagamore	New England Co.	104
Bge.	Winthrop	Kelley, Spear & Co.	841
Bge.	Number Five	New England Co.	909
Bge.	Black Sheridan Wilson Co.	Kelley, Spear & Co.	936
Bge.	Kentucky	Wm. Rogers	1575
Bge.	Number Six	New England Co.	910
Bge.	Foster	Kelley, Spear & Co.	841
Bge.	Gibson	Kelley, Spear & Co.	839
Ship	Erskin M. Phelps	Arthur Sewall & Co.	2998
Str.	Winifred	Bath Iron Works	2456
Bge.	Grant	Kelley, Spear & Co.	835
Bge.	Dunlo	Kelley, Spear & Co.	840
Str.	General Knox	Kelley, Spear & Co.	427
Sch.	Rachael W. Stevens	New England Co.	1211
Bge.	West Virginia	Wm. Rogers	1564
Slp.	Onward	Geo. H. Blair	18
Bge.	Number Ten	Kelley, Spear & Co.	897
Bge.	Virginia	Wm. Rogers	1548
Bge.	Number Seven	New England Co.	898
Bge.	Boyd	Kelley, Spear & Co.	473
Bge.	Parks	Kelley, Spear & Co.	474
Sch.	Nathaniel T. Palmer	Nathaniel T. Palmer	2440
			28689

RECAPITULATION.

Type.	Number.	Gross Tons.
Ships	1	2998
Schooners	3	5272
Barges	19	17377
Steamers	4	3012
Sloops	2	30
	29	28689

It will be noted that the list includes only those vessels which have been fully completed and turned over to their owners, and thus the Payne yacht and the torpedo boats Dahlgreen and Craven building at the Bath Iron Works, as well as some other craft, are not included.



Steam Yacht Aileen—Building at the Roach Ship Yard, Chester, Pa., for Richard Stevens, Hoboken, N. J.

HEAVY DEMAND FOR ENGINES.

D. M. Swain's marine engine works at Stillwater, Minn., is so crowded with work that it has been in operation twelve hours daily for weeks past. Among the contracts on hand is one for the machinery for a stern-wheel steamer building for Jacob Richtman & Sons of Elsberry, Mo., at that place. The engines are 12 inches diameter of cylinder by 72 inches stroke, and the two boilers are each 40 inches in diameter by 16 feet long, and the above firm also has a contract for a boiler for the steamer Camel. The Swain works will build a pair of oscillating engines for the side-wheel steamer (not yet named) building for the La Salle & Peoria Packet Co. These engines are of the compound condensing type, with one high pressure and one low pressure engine for each wheel, and will develop 300 indicated horse power. The La Salle & Peoria Packet Co. is officered by D. M. Swain, Percy Swain and C. W. Hicks, the address of the latter being Belvidere, Ill. Another contract recently closed by the Stillwater concern is with the Red Lake Transportation Co. of 510 Globe building, Minneapolis, Minn., for a full machinery outfit for their new side-wheel steamer. The engines are high pressure 12 inches by 72 inches; one of the boilers is of the locomotive type, with a fire box 54 inches long by 60 inches deep in order that wood may be used as fuel.

"We think we have the best thing in the way of a portable forge for ship builders," says one of the officers of the Crumlish Forge Co., Buffalo, "that is to be had in this country. Not long ago we sold twenty of them to the Cleveland Ship Building Co. Another recent order was from the Gas Engine & Power Co., but we have, in fact, sold them to ship builders all over the country, and especially on the Atlantic coast. But their use is not, of course, confined to ship yards. The Standard Oil Co. uses them exclusively on their tank and pipe-line work, and they are used on all kinds of bridge and structural work. We have for a standard one size and one price—90 pounds and $15—but we will, of course, make special size. We have been making forges for twenty-five years. Blacksmith coal is usually used in these forges, but they can be operated with any kind of coal."

KNAPP ROLLER BOAT.

THE INVENTOR OF A MOST REMARKABLE CRAFT OUTLINES HIS PROJECT AND MAKES STRONG CONTENTION FOR ITS PRACTICABILITY.

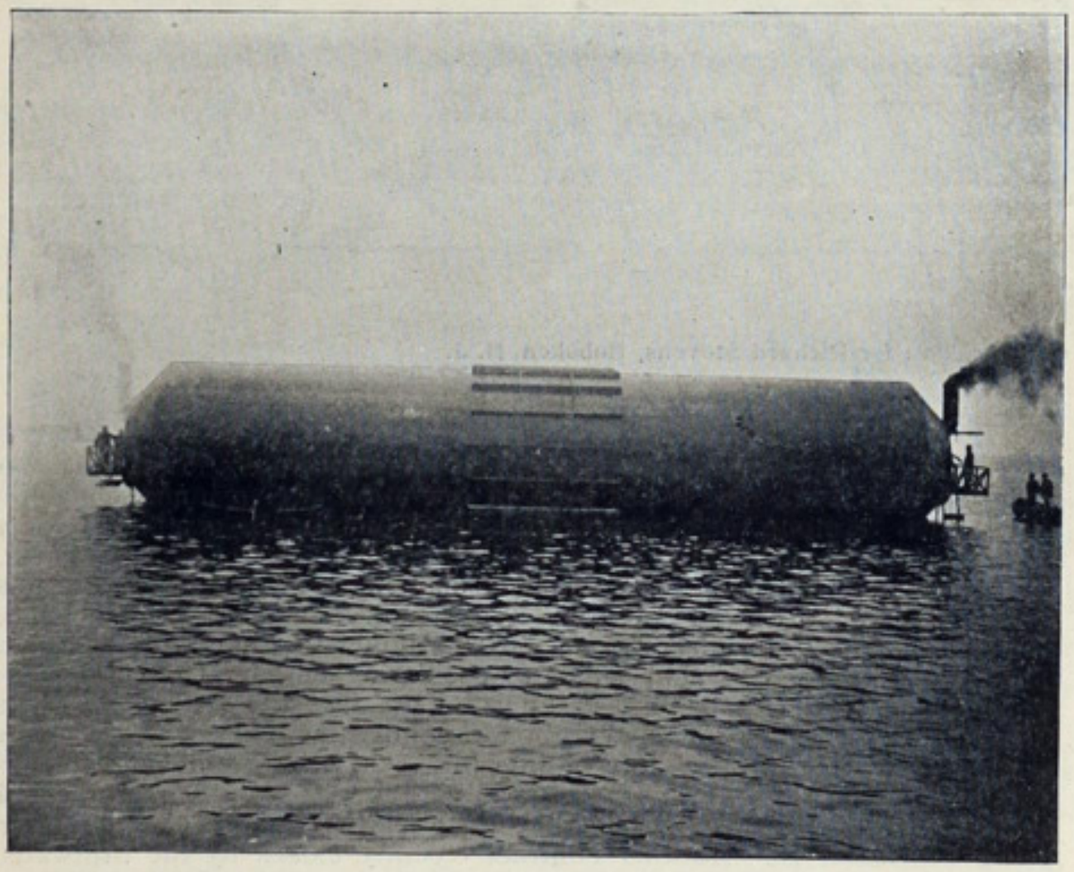
BY F. A. KNAPP

The troop ship which I some time ago offered to the United States government embodies to a pretty full extent the highest development that has been attained in the evolution of my invention. My engineer—a very good man—claims a speed of at least 50 miles an hour, but in submitting the plans I made a claim simply of a speed equal to the largest present type of freighter with less power, and possibly a much higher rate of speed. I propose to carry freight, such as grain or coal, hay or cotton, in the inner set of compartments of the cylinder, loaded as described in the specification appended to this article. The weight being thus equally distributed, I have an evenly balanced fly wheel to turn over.

The vessel which I built at Toronto—110 feet long, 22 feet in external diameter and 100 tons displacement, drawing 3 feet of water—was propelled six miles an hour with the power applied in a manner I never approved of. "Roller-boats" are said to be as old as the steam engine, but hitherto they have not been successful, because they were the inventions of men who may have been clever mechanics or engineers, but who were unable to comprehend the scientific problems involved. Such craft, under certain conditions, can be propelled all right, but are not as efficient as the present type of ship and could never make any considerable speed.

I have had to suffer from the difficulty of making my engineers appreciate the difference between power and gravity. I have always been of the opinion that speed cannot be obtained from gravity as applied in my boat, but gave way, however, as the engineers were unanimously against me. They put in practically two locomotives on a circular track, the weight climbing up inside. After two trials, they now admit I am right, and that by suspending the power and applying it to a central shaft "five times better results can be obtained." In this way it is power that does the work and not gravity, and I am satisfied that sufficient power can be applied to get practically unlimited speed, with a light draft, in this type of vessel, with little cost.

I utilize the forces of nature, which aid me to get speed, while the present type is fighting nature. Consequently, I will not need anything like the same amount of power, with vastly greater results. The Frenchman Bazin, lately deceased, who has been called an eminent engineer, could not succeed in getting high speed, because of another principle involved which he appears to have ignored, if he was aware of it, viz., the resistance of the water to the forward motion of the plow. His discs being thick at the center and thin at the circumference, always largely submerged, were in effect plows. He only talked of reducing skin friction, and so he would by that mode, but skin friction cuts very little figure at high rates of speed, even at 20 knots.



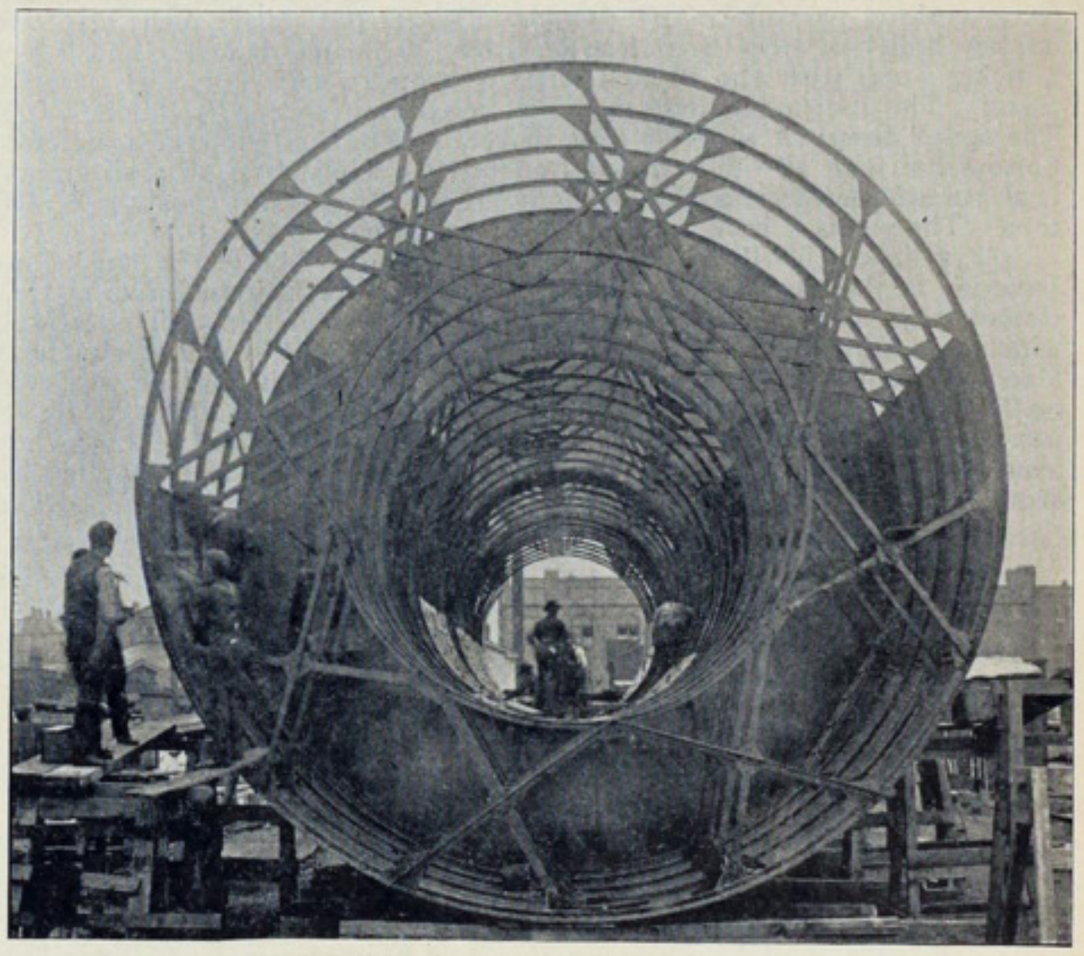
THE KNAPP ROLLER BOAT BUILT AT TORONTO, CANADA.

The Campania takes 30,000 horse power to get 20 knots, while the St. Louis takes 20,000 horse power to get 19 knots. It is not skin friction but the resistance to displacement of the water at the bows they must overcome, this resistance increasing as the cube of the velocity at this speed and in an unknown quantity beyond that rate. This type is built with fine lines to get the least possible resistance, but the Turbinia, with her 50 horse power per ton of displacement, rose her bow out of the water, and her fine lines were in the air; she could not keep her bow in the water with this great resistance and therefore she might just as well have been built with a square bow. The Campania takes 2½ horse power per ton of displacement, while my vessel will take about 1-9 of a horse power per ton of displacement, as proved by my experiments at Toronto.

My theory is that rolling broadside on over the water, I very quickly obtain a resistance which tends to lift my vessel to the surface. As water is incomprehensible and cannot be displaced quickly, I roll over it instead of through it, and it becomes a granolithic pavement, so to speak, under my vessel, because a body can only displace its own weight in water and as soon as the resistance exceeds the weight of my vessel, it must practically be rolling on top. Then, like the railroad train running up a grade, it takes less power on the level, and so I get great speed with less power. This is at a light draft of say 12 feet in a diameter of 200 feet.

I am told, however, by some engineers, who either cannot comprehend the principles involved or have not given the subject sufficient consideration, that such a vessel, exposing so great a surface, can never be propelled against a gale of wind, and they instance the Campania drawing 33 feet of water, or say two-thirds of her in the water, while nearly all of my boat is out of the water and exposed to the wind. Now it is not the wind that affects the Campania, but the water which strikes her with all its momentum, weighing 64 pounds to the cubic foot, the wave motion having a speed of say 70 feet per second; on the other hand, the wind is striking the one-third of her which is out of the water with a pressure of a few pounds to the square foot.

Water is 825 times heavier than the air, but the Campania goes through it, necessarily at a reduced speed. With my vessel, the resistance of skin friction and the blow of a wave which is much below the center, knocking her legs from under her so to speak, are aids to speed. I turn the enemy into a friend and am working with nature instead of fighting her. The wind can no more stop my vessel, weighing 17,000 tons and upwards, according to her load, than it can a railroad train.



THE KNAPP BOAT IN PROCESS OF CONSTRUCTION.

I am told again by the engineers that the weight has nothing to do with it, and that there is no power in momentum. I have given up arguing with them as hopeless, and have given them the following problem: A railroad train with an ordinary mile-a-minute engine on geared trucks made a little over two miles a minute, without increasing its piston speed; assuming calm weather, it had to overcome about 3000 horse power of wind resistance; how does it do this with steam power alone? I have not so far had an answer except that if I am right "they will have to re-write their books." It does seem strange to me that men who are trained in science should so fail to comprehend one of the greatest of nature's forces, the inertia of motion.

Steam power is able to overcome the inertia of rest, as in the railroad engine, and with less power it keeps up the inertia of motion. No ordinary railroad engine could possibly draw a heavy express a mile a minute with steam power alone. The mere book man seems to be away back dealing with the elementary definition of momentum, while the practical man is utilizing it as a great force.

Now as to the practical aspect of my invention, apart from the question of high speed. I may say that the Toronto model has been driven six miles an hour, with one-seventh of her diameter immersed, and with less than 20 horse power. This proves that my boat can go, and that I can cross the sea is unquestionable. Then what as to her efficiency? Let us refer to her displacement at different draughts. Beginning with 12 feet we have 21,606 tons, and taking off her weight at 17,000 tons, we have a carrying capacity of 4,606 tons, or greater than the Campania; at this draught she will practically run over the surface at greater speed and with very much less power than that ship requires. At 25 feet the total displacement is 55,705 tons, leaving 38,705 tons carrying capacity. The question of whether this shall be carried in the swinging vessels or in the compartments in the cylinder is only a matter of detail. I prefer to carry it in the compartments. At 30 feet the total displacement becomes 76,595 tons—approximately 60,000 tons of coal say, or 2,000,000 bushels of wheat. And where the limit comes you can tell as well as I can. At these depths my vessel will travel, as shown by my boat at Toronto, and only requires the power necessary to turn slowly this great evenly-balanced fly-wheel. My claim is that I can drive this vessel at the latter displacement at a speed of at least 10 knots with 3,000 horse power at the very utmost. But suppose it took a far greater horse power, where is there anything to compete with it?

Then I control all traffic on the seas, and the changed conditions will find their own level. It has been said that my boat can only reach this stage after much experimenting and loss of time, but I think many

will agree with me that this does not follow. The experimental stage is past. The large boat can be built at once, ready to do all this work. What does it matter if weights are excessive and bearings crude, etc., etc., when this vessel is so far beyond competition in its crudest form. It is very simple in its construction and in the application of power.

It will certainly be a process of evolution to reach perfection, and so the second vessel will be better than the first, just as the railroad engine has grown. The early railroad engines look to us very crude now, but they displaced the stage coach.

As noted in the specifications that follow, foregoing figures relate to a large ocean-going boat, 200 by 800 feet. My plans for a lake craft are for a vessel 95 feet in diameter by 500 feet long, which will carry three times more than the largest of the present lake boats, and can be driven at an equal or greater rate of speed with much less power. My boats are also much less expensive to construct. I may say that I have many broad scientific men and several eminent engineers and naval architects who fully agree with me.

SPECIFICATIONS FOR THE KNAPP BOAT.

Specifications accompanying the plans for a troop ship, which Mr. Knapp recently submitted to the United States government, and reference to which is made in the foregoing article, provide for a vessel 200 feet in diameter and 800 feet long, capable of accommodating 30,000 men, with provisions, and 30,000 tons of coal as cargo. There would be eight decks of varying sizes and each 8 feet 3 inches from floor to ceiling. The vessel would contain between the intermediate and outside skins 780 compartments, each being 62.8 feet long at the shell. Between the intermediate and internal skins 600 additional compartments would be provided.

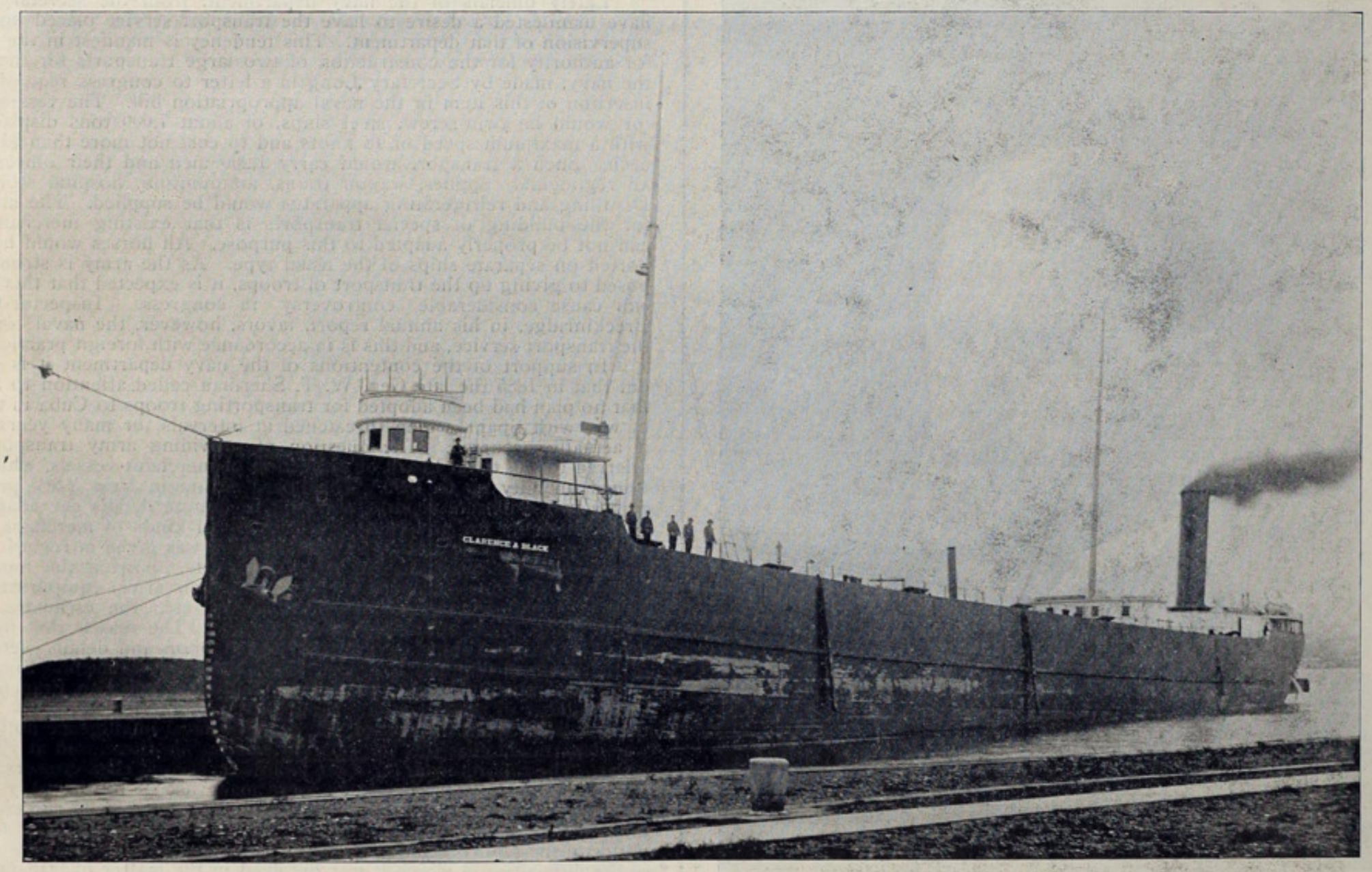
The engine compartment is placed in the middle of the ship and is 200 feet in length by 168 feet in diameter. It is swung on journals at each end, these journals being the same on which the cabins swing, but the engine platform is entirely independent of these cabins and can oscilate in any direction without affecting them. There is in the very bottom a tank sufficient to carry enough fresh water to feed the boilers. Above this is the stokehole floor and two batteries of three boilers, each of 3,000 horse power, or a total of 6,000 indicated horse power; boilers to be of the water tube type. On this floor and close to the boilers are the coal bunkers with a capacity of 3,000 tons.

The engine platform is to be 12 feet higher up, and there will be two sets of triple expansion engines of 6,000 horse power each. Only one set at a time is used to propel the ship, the other being used to couple in the event of an accident. Engines are of the long stroke type with cranks at 120 degrees, so as to insure a uniform pressure on the crank shaft Cylinders to be 28½, 46 and 75 inches by 9 feet stroke, with fifty revolutions per minute, working on an extra heavy crank shaft, to which is keyed two pinions, working two internal spur gears, above the center of motion at each end. The engine framing being hung on the center and the power applied above the center, all the power and weight is applied to force the shell round the center, and at the same time by driving from fifty revolutions down to ten revolutions gain immensely in power. This is allowing largely for slip, while at the time having full command of the engine. The water supply for sanitary purposes and surface condensation is gotten by a series of buckets joined by pipes which discharge in a large tank in the engine room. These buckets pick up the water when the ship is in motion; when stationary the water is supplied by a donkey pump to the tank. The engine room is fitted with a series of dynamos to run the hoists and steering gears. To light the ships these dynamos are driven by friction of the outer shell when revolving, or by a separate engine when in port. The main engines are fitted with turning and reversing engines.

GREAT LAKES FREIGHT STEAMER C. A. BLACK.

A picture of the Detroit steamer Clarence A. Black, regarded as one of the most economical freight carriers in this country, is presented herewith. This vessel, built by the Cleveland Ship Building Co. and fitted with the Howden system of hot draft, through arrangement with the Dry Dock Engine Works of Detroit, is credited in two elaborate reports of tests with having shown a fuel consumption of a little less than 1½ pounds of coal per indicated horse power per hour. The Black is a vessel of the ordinary coarse-freight type in general use on the great lakes, and is of 6,800 net tons capacity. She is 414 feet over all, 50 feet beam, 28 feet depth. Her load of 6,800 net tons is carried on about 17 feet draught. Engines are of triple expansion type, with cylinders of 22, 35 and 58 inches diameter and 40 inches stroke; air pump 32 inches diameter and 14 inches stroke. She has two Scotch boilers of 13 feet 2 inches diameter and 12 feet length over all, allowed 165 pounds working pressure; four furnaces, 48 inches inside diameter with grates of 5 feet 6 inches—88 square feet; total heating surface 4,292 square feet; propeller, sectional, four-bladed, 13 feet 6 inches diameter and 14 feet pitch.

Particulars of a trial of this vessel showing a consumption of only 1.46 pounds of coal per I. H. P. per hour are as follows: Steam pressure, 165 pounds; vacuum, 22 inches; average revolutions, 87.7; indicated horse power, H. P. cylinder, 482.3; I. P. cylinder, 538.5; L. P. cylinder, 505.8; total average, 1,526.6; ref. M. E. P. to L. P. cylinder, 32.7; ratio of horse power to grate surface, 17.3; ratio of heating surface to horse power, 2.8; duration of test, 6 hours 2 minutes; total coal burned, 13,440 pounds; coal per hour, 2,228 pounds; coal per hour per I. H. P., 1.46 pounds; coal per hour per square foot of grate surface, 25.32; air pressure at fan, 1⅛ pounds; temperature at hot well, 139°; temperature of feed water after leaving heater, 175°; speed of vessel, 12.23 miles; speed of propeller, 13.95 miles; slip of propeller, 23.3 per cent.



Great Lake Steamer Clarence A. Black—Said to be the most economical freighter in the United States.

A strange co-incidence is found in the death during 1898 of four of the men most prominently identified with ship building on the Delaware river—the Clyde of America. The death of Jacob G. Neafie was followed by that of John H. Dialogue, Charles Hillman, and J. Taylor Gause, the late president of the Harlan & Hollingsworth Co. of Wilmington.

The Fore River Engine Co., Weymouth, Mass., has received orders for two triple expansion engines for yachts now building. Cylinders will be 7, 11½ and 19 inches by 10 inches stroke. They also have the contract for a compound engine, with cylinders 12 and 24 inches by 16 inches stroke, for the steam yacht Arenal.

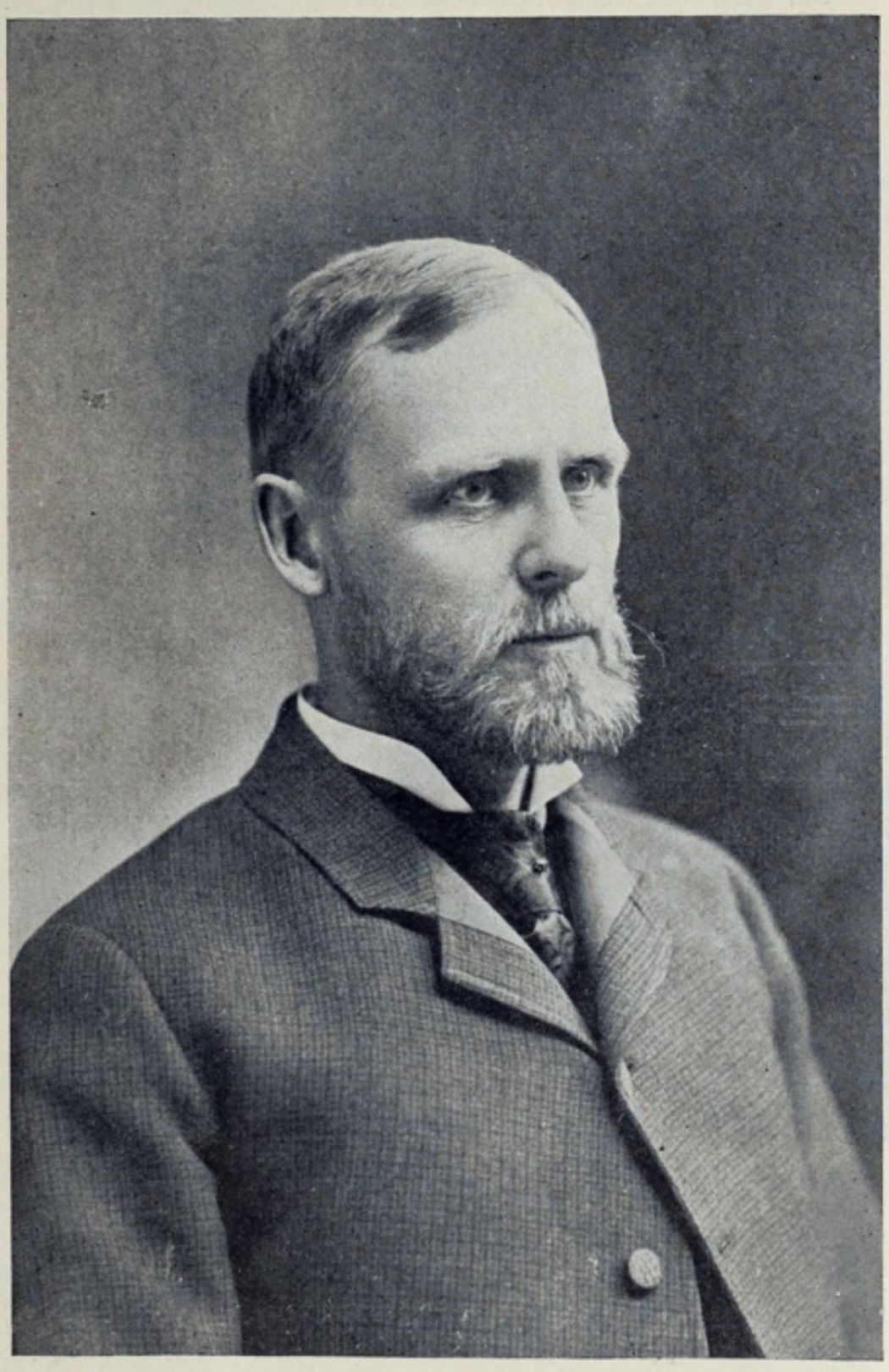
The work of rebuilding the Starin ship yard, Long Island, N. Y., which was recently damaged by fire, is well under way. The new plant will be much larger than its predecessor.

UNITED STATES ARMY TRANSPORTS.

EXTENSIVE ALTERATIONS BEING MADE IN A NUMBER OF FIRST-CLASS VESSELS, WITH A VIEW TO THEIR PERMANENT UTILIZATION IN THE SERVICE—MORE WORK FOR SHIP YARDS.

A number of the more prominent American ship yards, including the Cramp yard at Philadelphia and the Bath Iron Works at Bath, Me., have been engaged for some weeks past on repairs and alterations to vessels selected for use as permanent troop ships by the army transport service of the war department. Vessels retained at the close of the war for this service include the Panama, Port Victor, Rita, Mohawk, Mobile, Massachusetts, Manitoba, Minnewaska, Mississippi, Michigan, Roumania, Obdam, Berlin, Chester and Britannia. They are in most cases vessels of 5,000 and 6,000 gross tons and of adequate engine power, the Mohawk, which may be taken as representative of the type, being equipped with triple expansion engines that have cylinders of 22½, 36½ and 60 inches by 48 inches stroke, and eight double-ended Scotch boilers, 18 feet long by 15 feet diameter, with a working pressure of 175 pounds. These engines, of 8,000 indicated horse power, are capable of driving the vessel at a speed of 14 knots. This is the approximate speed of all of the vessels now being converted into transports.

Alterations made in the vessels have or will cost in the neighborhood of $100,000 in each case, and in some instances will exceed that. Most of the vessels were formerly employed in the cattle trade, and have six or seven decks. The lower ones have been converted into sleeping apartments, provided with iron bedsteads. On the mess deck mess tables are hung out of the way overhead, so that they can be let down when needed. Commodious hospital quarters have been provided on each vessel. Most of the vessels are fitted to accommodate from 2,400 to 2,700 troops, with an average crew of from 175 to 200 men.



FRANK E. KIRBY OF DETROIT, NOW OF THE U. S. ARMY TRANSPORT SERVICE.

Readers of the Review residing in the great lakes region, will be interested to learn that Frank E. Kirby of the Detroit Dry Dock Co., Detroit, Mich., has devoted the major part of his time for months past to this branch of the government service, aiding in the selection of vessels and personally superintending the alterations.

Uniforms have been adopted for use by officers and crews of the transports, and an elaborate set of regulations adopted for the government of the service. They are in part as follows: "The army transport service is organized as a special branch of the quartermaster's department of the army, for the purpose of transporting troops and supplies between the United States and such over-sea garrisons and military commands as shall be authorized. All necessary expenses incident to that service will be paid from appropriations made for the support of the army. For this purpose the organization and conduct of the service will be assimilated as nearly as practicable to the most improved methods of administration of a chartered steamship business, subject to such modifications as shall better adapt it to governmental purposes and the general requirements of military administration. The service will have full charge of and responsibility for the berthing of all authorized persons on board, and will supply everything necessary for that purpose. The saloon, cabin, and other supplies and equipment for the several classes of persons transported will be of the best quality and such as are provided in passenger steamers of standard class. Subject to the supervision of the quartermaster general, this service will be conducted by its own officers and employes, specially selected or appointed, and under its own regulations and be made, as far as practicable, independent of the administration of other branches of army transportation. There will be two home ports or headquarters for the service, one, at New York for the Atlantic traffic and one at San Francisco for the Pacific traffic. Each home port will have its full equipment of officers and employes, and be provided with proper terminal facilities, including wharfage for ships and storage for freights, and with suitable and adequate offices and clerical and other staff for the conduct of its business."

In detailing the duties of various officers it is stipulated: "The marine superintendent will be a person skilled in the navigation, handling, loading and care of ships in port and at sea, and familar with the duties of masters and other officers on board of sea-going vessels of the first class. Under direction of the general superintendent the marine superintendent will have personal charge of all transports at the home port, will supervise and direct their movements, docking, loading and general repairs, and be responsible for their care and maintenance in a condition of complete efficiency at all times and in all respects other than in matters pertaining to the superintending engineer."

Lately officials of the navy department, from the secretary down, have manifested a desire to have the transport service placed under the supervision of that department. This tendency is manifest in the request for authority for the construction of two large transports for the use of the navy, made by Secretary Long in a letter to congress requesting the insertion of this item in the naval appropriation bill. The vessels called for would be twin-screw, steel ships, of about 7,000 tons displacement, with a maximum speed of 18 knots and to cost not more than $1,250,000 each. Such a transport would carry 1,200 men and their officers, with all regimental supplies, wagon trains, ammunition, hospital stores, etc. Distilling and refrigerating apparatus would be supplied. The argument for the building of special transports is that existing merchant ships can not be properly adapted to this purpose. All horses would be transported on separate ships of the usual type. As the army is strongly opposed to giving up the transport of troops, it is expected that this request will cause considerable controversy in congress. Inspector-General Breckinridge, in his annual report, favors, however, the naval control of the transport service, and this is in accordance with foreign practice.

In support of the contentions of the navy department it is pointed out that in 1885 the late Gen. W. T. Sherman called attention to the fact that no plan had been adopted for transporting troops to Cuba in the case of war with Spain, which threatened at intervals for many years before it actually occurred. The question of providing army transports was referred to the naval board of inspection of merchant vessels, which continued on duty up to 1890. The board sitting in New York presented eighty-two elaborate reports, showing in minute details the adaptability and availability for government service of all kinds of merchant marine vessels visiting New York. Full information was given in regard to such vessels as were available for army transports, showing the number of troops of all arms, each could carry, with their arms, equipments, commissary, quartermaster and medical stores, etc., the estimates of the board being based upon English experience. The vessels that might be used for hospital ships were also reported upon and details were given of the changes required to make them thoroughly efficient. Similar reports were made of vessels at Boston, Baltimore and San Francisco, the total number of reports on file being in the neighborhood of 500. When the war with Spain threatened, the office of naval intelligence notified the war department that this information was on file there, and at their disposal. The reports from the same boards on second class cruisers, scouts, torpedo vessels, dispatch vessels, were made use of by the navy department and proved one of the most valuable features of its successful administration of the navy during the war. The war department took no notice of the reports relating to army transports, and hence followed some of the difficulties in which it was involved in the matter of transportation and the criticisms which resulted from this neglect.

PRESIDENT OF THE LAKE CARRIERS.

The selection of a president for the Lake Carriers' Association is a matter of especial interest in the great lakes region, not on account of advantages of any kind attending the position, but in view of the honor attached to the chief office of an organization that represents practically the entire tonnage of the lakes. This year, as usual, there has been no one put forward for the place, and now the annual meeting, to be held at Detroit on the 24 inst, is very close to hand. Capt. Alex. McDougall of Duluth, and Mr. W. S. Brainard of Toledo, have both been mentioned, but with no effort in either case to secure the active support of members of the association. In fact, neither of the gentlemen named have even expressed a desire for the position. Now the friends of Mr. A. B. Wolvin of Duluth announce that an effort is being made to have him say that he will take the office if it is offered to him, and they are quite certain of his election if he desires the position. He is from the head of the lakes, a district that has not as yet been honored with the presidency. He is a large owner in a fleet of steel steamers that are in all respects the finest on the lakes. He is closely identified with the line-boat interests of Buffalo, with the grain trade of the northwest and with the iron ore interests. Mr. Wolvin will undoubtedly be elected president of the association if he permits of his name being used by friends who will approach him on the subject during the present week.

The Cleveland City Forge & Iron Co., Cleveland, has the contract for engine frames for the four Morgan and two Cromwell liners, now building at the Newport News ship yard. The contract for the engine forgings goes to the Midvale Steel Co.

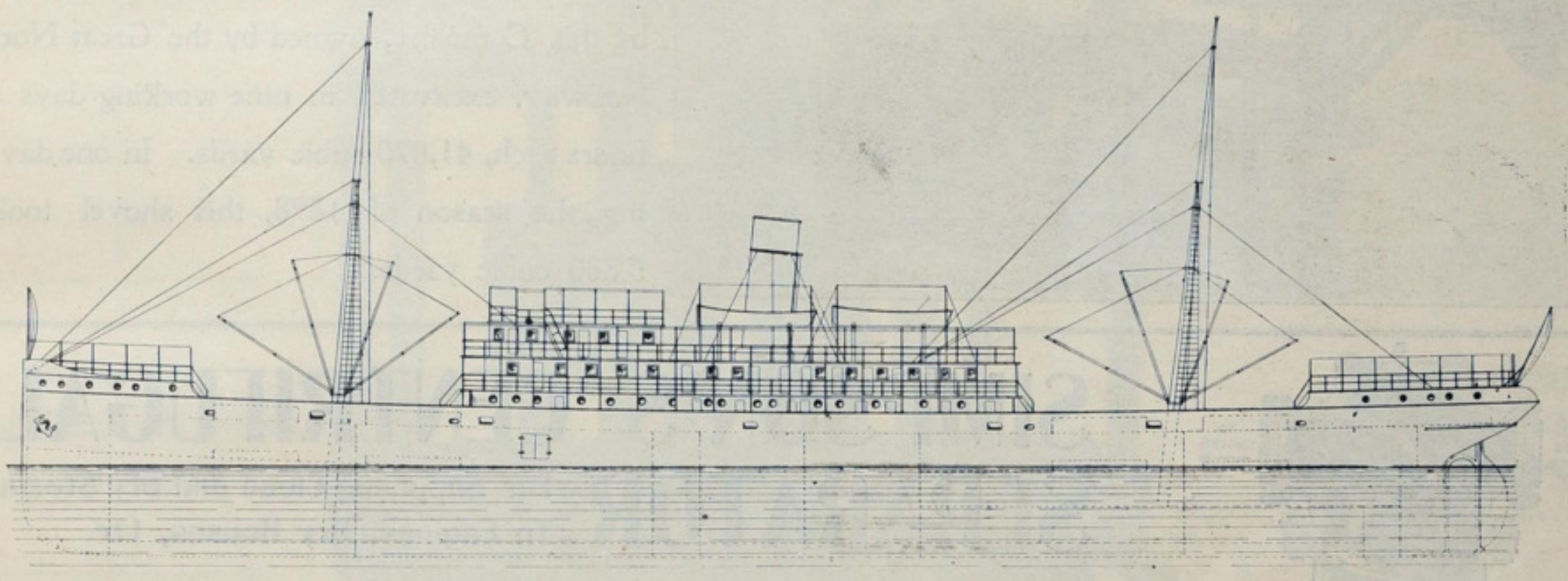
PONCE AND SAN JUAN.

FIVE STEAMERS FOR WEST INDIAN SERVICE, TO BE BUILT BY THE HARLAN & HOLLINGSWORTH CO. OF WILMINGTON, DEL.—OTHER CONTRACTS AT THE HARLAN & HOLLINGSWORTH YARD.

During the year 1898 the Harlan & Hollingsworth Co. of Wilmington, Del., closed contracts for twelve vessels. When it is noted that of this number seven were for steamers of from 250 to 300 feet over all for coastwise freight and passenger service, it will be readily understood that the business of this company of late in merchant ships has been more than equal to that of the biggest yards of the country.

Two of the contracts most recently closed are for the steamers Ponce and San Juan, to be built for Miller, Bull & Knowlton of Hanover Square building, Pearl street, New York, owners of the Winifred, the first American "tramp" steamer, which was built by the Bath Iron Works, Bath, Me. The new vessels, an outboard drawing of which is herewith presented, will engage in the West Indian trade. They will be 317 feet keel, 42 feet beam, 27 feet 8 inches depth and of about 3,000 tons gross and 170,000 cubic feet measurement. They will be equipped with single screw triple expansion engines with cylinders 24, 38 and 62 inches by 42 inches stroke. Steam will be supplied from two Scotch boilers, 14 feet 6 inches in diameter by 11 feet long, with a pressure of 180 pounds. These vessels, which will each have six watertight compartments, will be strictly first class steamers, and in addition to adequate cargo space will each provide accommodations for about 60 first-class and 25 second-class passengers. The vessels are expected to be able to maintain a speed of 14 knots. The equipment of the steamers will, of course, be essentially modern in all respects and will include Williamson steering engines.

Another contract closed by the Harlan & Hollingsworth Co. within a month past is with Boulton, Bliss & Dallett of New York city, for a $210,000 steel, twin-screw, freight and passenger steamer for the Red "D" Venezuelan line. This steamer, which will have a capacity of 1,500 gross tons on a draught of 13 feet 6 inches, will be 277 feet 6 inches over all, 266 feet inside of stem to the inside of the rudder post, 37 feet moulded beam, 18 feet 6 inches moulded depth, and 19 feet 4 inches depth at center. She will be equipped with two sets of triple expansion, surface condensing engines, with cylinders of 14, 22 and 36 inches diameter and a stroke of 24 inches. Steam will be supplied from two Scotch boilers, 12 feet 9 inches in diameter by 12 feet in length, at a working pressure of 160 pounds. The main deckhouse will be of steel, with the interior finished in hard woods and the stairways of oak. On top of this will be placed the upper deckhouse, which will also be of steel. Accommodations will be provided for first and second-class passengers, the house for the latter being on the after deck. The social hall will be finished in maple. There will be two steel pole masts and five cargo booms. The equipment will include four Williamson hoisting engines and a steam steering gear of that company's make. Fire alarms will be placed in each hold with indicators of improved pattern, to give the proper location of a fire. The propellers will be of solid manganese bronze, and a repeating engine room telegraph system will be installed throughout.



Steamers Pence and San Juan, Building by the Harlan & Hollingsworth Co., for Mellen, Bull & Knowlton.

The steamer Tennessee, which was completed at the Wilmington yard in the autumn for the Baltimore Steam Packet Co., and which was fully described and illustrated in the Marine Review of Oct. 27, 1898, has been in commission but a short time, but has already made a record alike creditable to the builders and satisfactory to her owners. The Tennessee is 245 feet from inside of stem to inside of stern post, 33 feet 8 inches beam molded at 10-foot water line, 38 feet beam molded at deck, 43 feet breadth over guards and 15 feet depth molded at side. The hull was built in accordance with the rules of the United States Standard Register and is of steel throughout, the plates ranging from 7-16 to ½ inch in thickness and affording a construction fully 20 per cent heavier than is customary in vessels of this class, but very desirable in view of the conditions prevailing on the Chesapeake, where the vessel is in service. The steamer has a longitudinal bulkhead extending from the water tight bulkhead aft of the engine room to the watertight bulkhead at the stern. Power for propulsion is furnished by twin-screw triple expansion engines of 2,400 indicated horse power and with cylinders 18, 28 and 45 inches by 30 inches stroke. There are three Scotch boilers, 11 feet in diameter by 11 feet 6 inches in length, with 160 pounds pressure. The Tennessee is capable of making 19 miles per hour with a full cargo of freight and fuel aboard. She has accommodations for about 300 passengers and 2,500 tons of freight and cost in the neighborhood of $250,000.

The sister steamers Kershaw and Nantucket, building by the Harlan & Hollingsworth Co. for the Merchants' & Miners' Transportation Co. of Baltimore, Md., are at present just at the launching stage. The vessels have a length on a 16-foot water line from inside of stem to inside of main post of 274 feet, beam molded 42 feet, depth of hold from base line to third deck beams at dead flat 26 feet, to fourth deck 34 feet, and spring of beam amidship 10 inches on third and fourth decks and 9 inches on first and second decks. These vessels, which will be exact duplicates of the Juniata of the same line, will be driven by direct, tri-compound engines with inverted cylinders, 28, 45 and 72 inches by 54-inch stroke. Steam will be supplied with four boilers of the cylindrical, return tubular type, 14 feet 6 inches in diameter by 12 feet long, with a pressure of 170 pounds. The vessels, which are expected to develop a speed in excess of 16 knots, will be completed about April 1, 1899. They will be equipped with Blake pumps, Hyde steam capstan windlasses, Morison furnaces, four Williamson steam hoisting engines, with cylinders 8 by 8 inches, and Baldt stockless anchors.

The steamer S. T. Morgan, also built by the Harlan & Hollingsworth Co. during the year, is described elsewhere in this issue.

IRON ORE BUSINESS FIXED FOR 1899.

An immense volume of business in the iron industry is certainly indicated by the fact that the big ore companies, controlling the principal mines of the Lake Superior region, have already made contracts covering the transportation of a very large part of their output for the coming year. Of late years these contracts have not been made until well into April or May, but this year the owners of large steel vessels were found willing to accept the contract rate of last season—60 cents on charters running from the opening of navigation to Nov. 1—and in a few days of the past week engagements involving the transportation of several million tons of ore from the head of Lake Superior to Ohio ports were hurriedly closed up. The Carnegie company which is the principal producing-consuming interest in the ore business, was not required to await a settlement of prices or sales in order to provide for lake transportation, and when the opportunity offered to duplicate last season's contracts, their entire business in Lake Superior ore was closed up at once. Other producers have followed with similar vessel contracts. It is well known, of course, that there are no vessels of the 2,500 or 3,000-ton class capable of moving ore without loss at this rate, but the rate was made for the big ships. The outlook is so encouraging, however, that some of the owners of vessels capable of carrying ore at this rate will undoubtedly take chances on wild business rather than tie up to contracts. Higher rates for 1899 were expected, but it is the old story of vessel owners professing high notions and then taking whatever is offered them on contracts.

A second illustrated edition of the lecture on "Mechanical Draft for Steam Boilers," delivered at Cornell university by Walter B. Snow of the engineering staff of the B. F. Sturtevant Co., Boston, has just been issued to meet the demand for information on this important subject. Copies may be obtained upon application to the Sturtevant company.

In its recently issued "Bulletin G," the B. F. Sturtevant Co. of Boston illustrates and describes a unique generating set, in which both the engine and the generator are entirely enclosed, although perfectly accessible through suitable doors. Such a device is of manifest utility wherever the atmosphere is laden with dust. This bulletin, containing other information of interest, will be mailed on application.

E. G. Heald of Auburn, N. Y., has considerable work in sight. Nearing completion is a 45-foot steam launch, valued at $3,000, for C. P. Burr of Auburn, N. Y. She is equipped with compound engines, 4½ and 9 inches by 6 inches stroke. Mr. Heald is negotiating with the Auburn City Railway Co. of Auburn, N. Y., for a 110-foot passenger steamer, to cost $11,000, and to be equipped with compound engines, with cylinders 8 and 14 inches by 11 inches stroke. His draughtsmen are at work on plans for a 45-foot steam launch with an engine of 5 and 10-inch cylinder diameters by 7-inch stroke for F. Chamberlain of Lyons, N. Y.

H. Manley Crosby, whose yard is at the foot of 45th street, Brooklyn, N. Y., is another builder who is busy with small vessels. Among the work in hand is a 20-foot, $1,500 knockabout for S. G. Bayne of New York; an 18-foot $600 catboat for Joseph W. Lawrence of New York; an 18-foot, $1,000 racing catboat for a New York purchaser; a 24-foot, $2,500 auxiliary yawl for A. E. Wicks of New York; and a 25-foot, $2,000 racing catboat for Charles Bedford of New York.

HOWARD P. EELLS, President.
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A. W. ROBINSON, Engineer.
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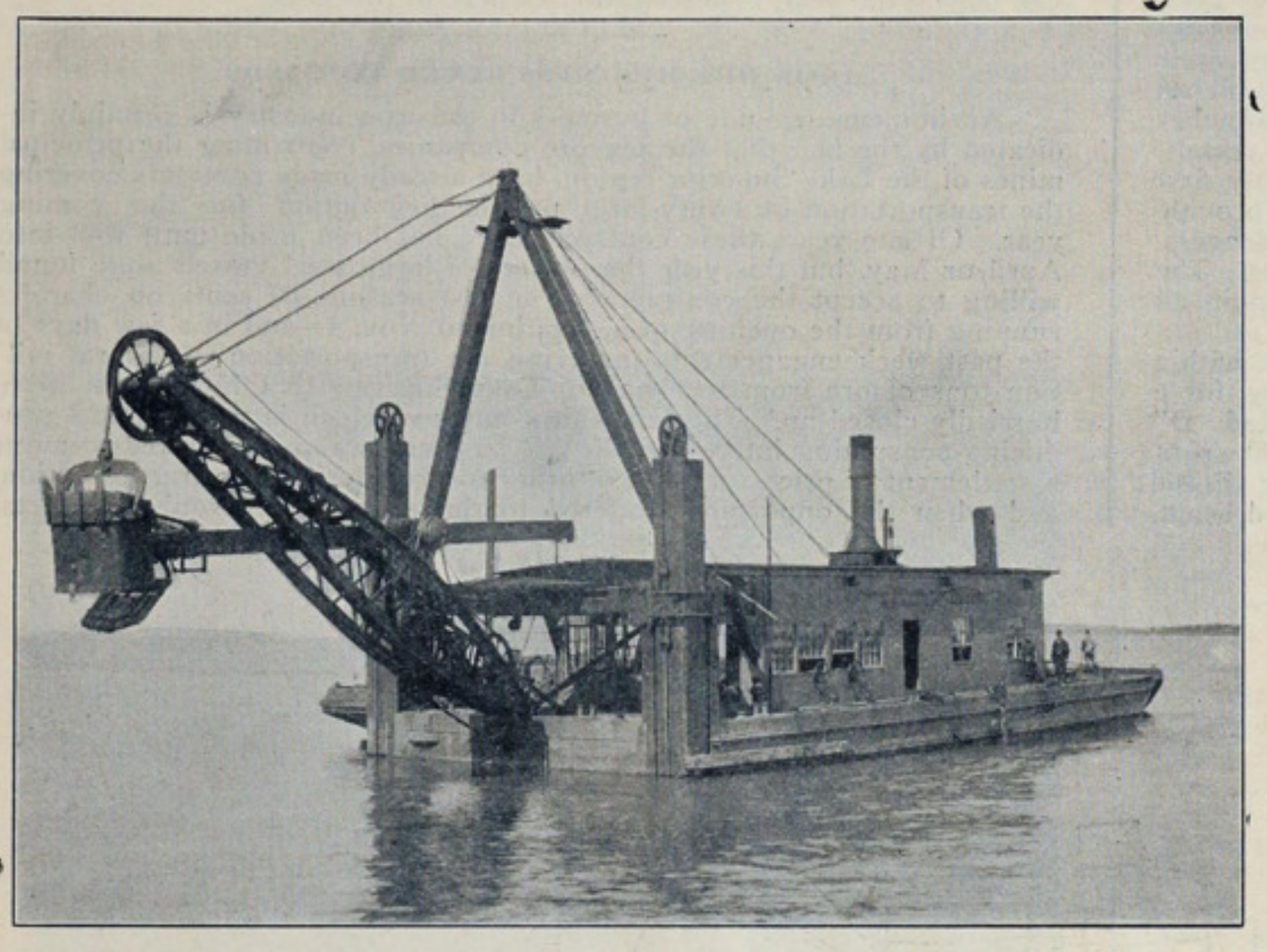

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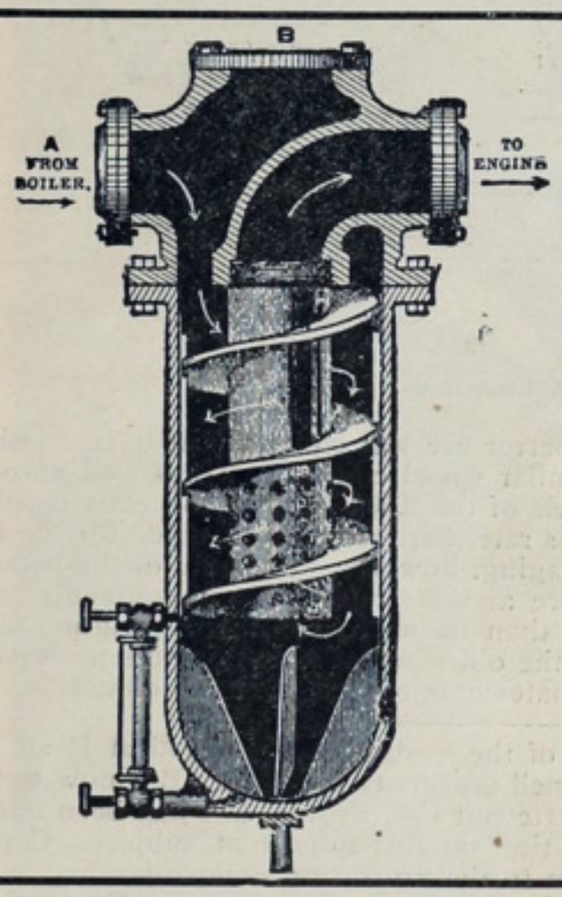

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For Supplying Clean and Dry Steam To Engines, Dry Houses, Etc.

Place Separator as close to Engine as possible. The steam taking a spiral course between the threads causes the water to be thrown by centrifugal force against the outer walls, while the dry steam goes through the small holes to center of pipe. Steam can enter at A or B, as convenience may require; also used in conveying steam long distances for Steam Hammers and Dry Houses.

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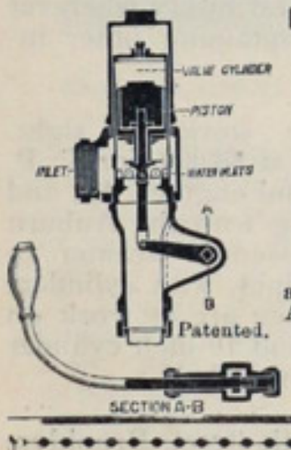
THE KENNEY FLUSHOMETER

FOR FLUSHING WATER-CLOSETS.



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THE BEST SYSTEM EVER INVENTED FOR USE ON STEAM VESSELS.

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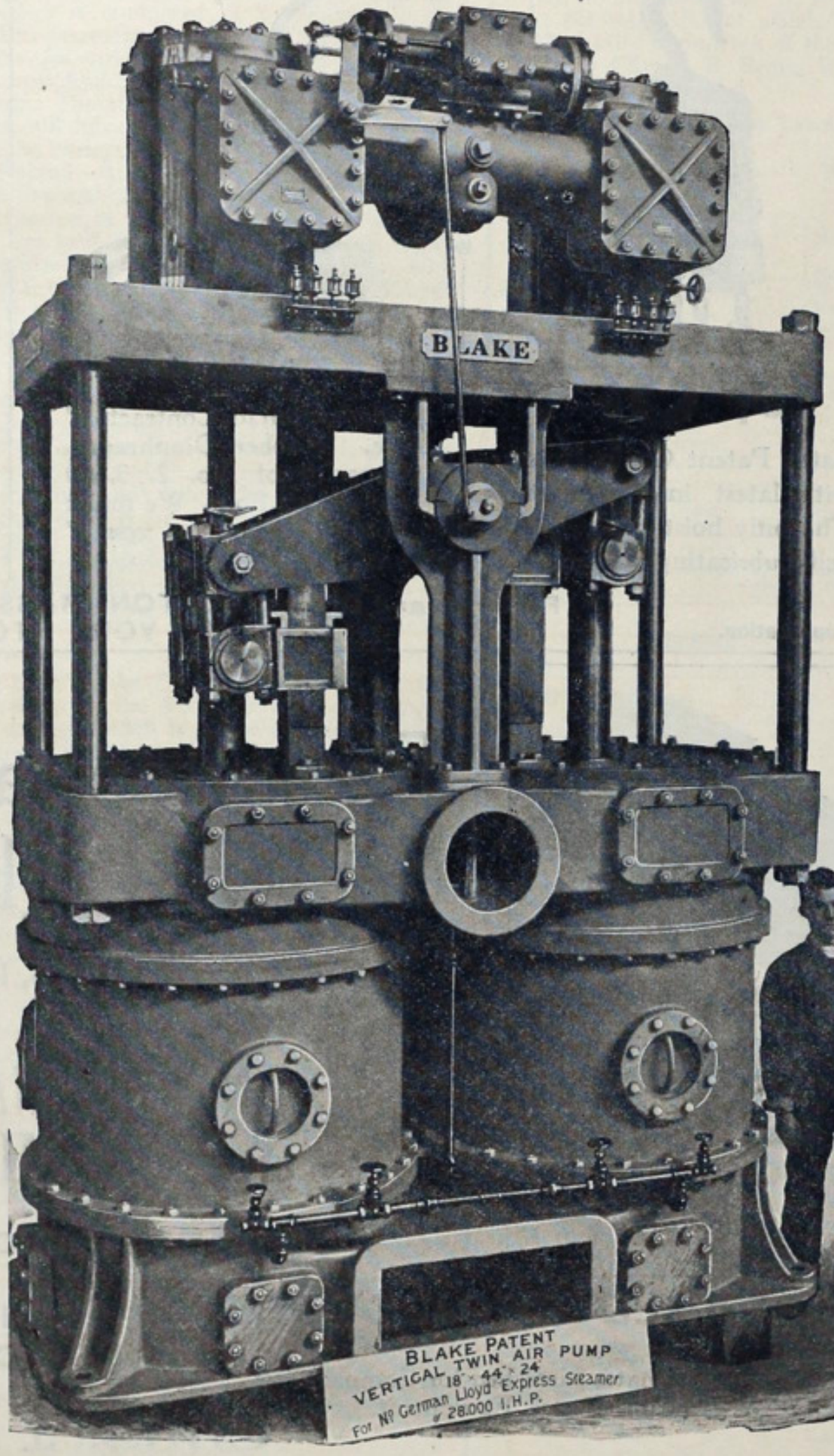
The Largest Independent Air Pump in the World.



ONE OF THE TWO

Blake Vertical "TWIN" AIR PUMPS,

of the New Hamburg-American Steamer "Deutschland" (building) of 34,000 aggregate Horse Power.

THE Blake Vertical "Twin" Air Pumps are also in use on the U. S. Cruisers New York, Columbia, Minneapolis and Brooklyn, the Battleships Massachusetts, Indiana, Iowa, and several warships of the German, Spanish and Austrian Navies; Revenue Cutters Gresham, Daniel Manning, Hugh McCulloch and Golden Gate; also on many Merchant Steamships, Ferry-Boats, Steam Tugs, etc.

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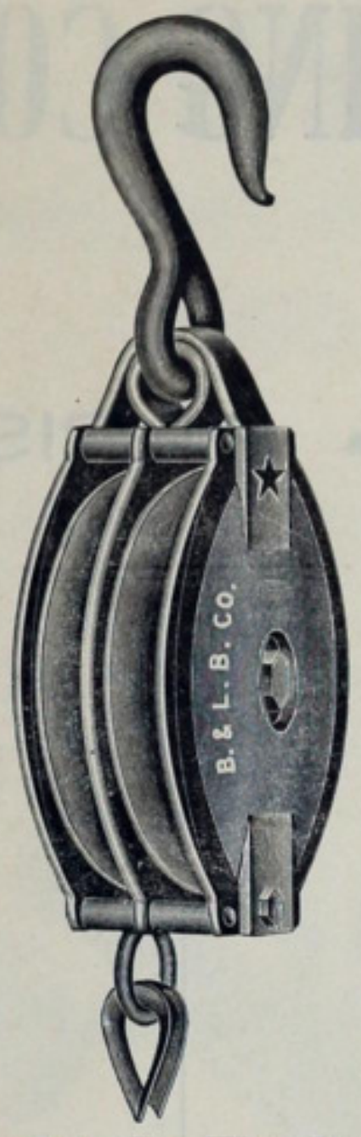
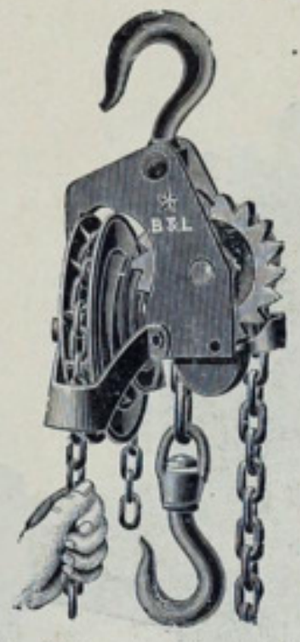
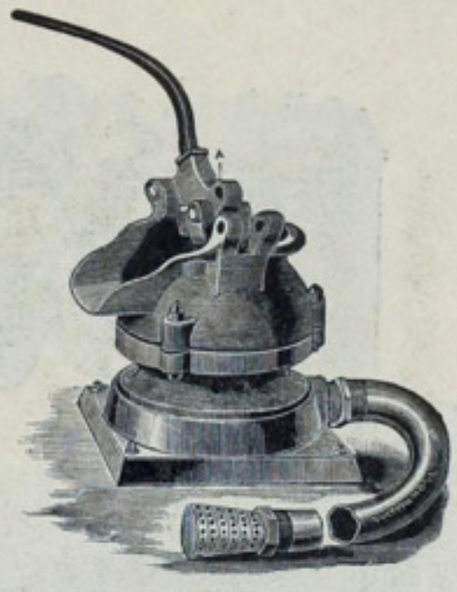


Fig. 218.—For Wire Rope. Latest pattern; furnished with any kind of bushing. We recommend "Star Metaline" as best for this style.



Batt's Patent Chain Hoist, with latest improvements. The only hoist made with Self-Lubricating Journals.



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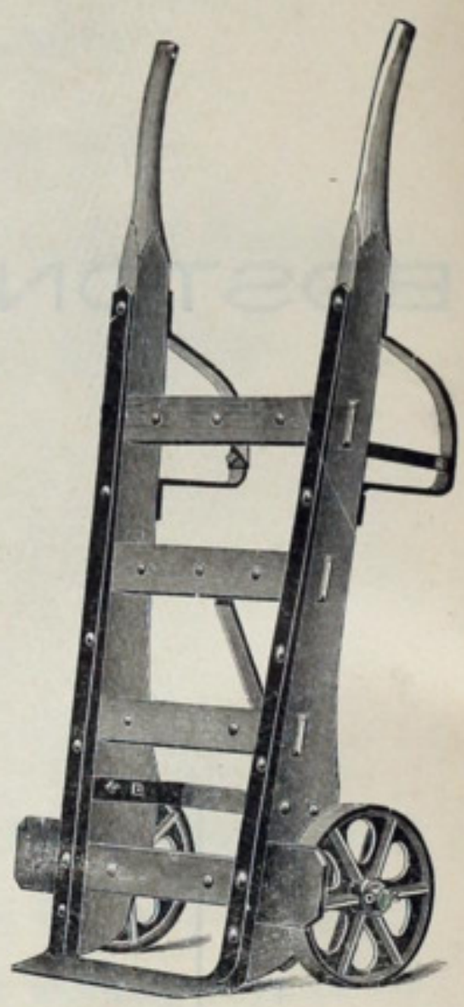

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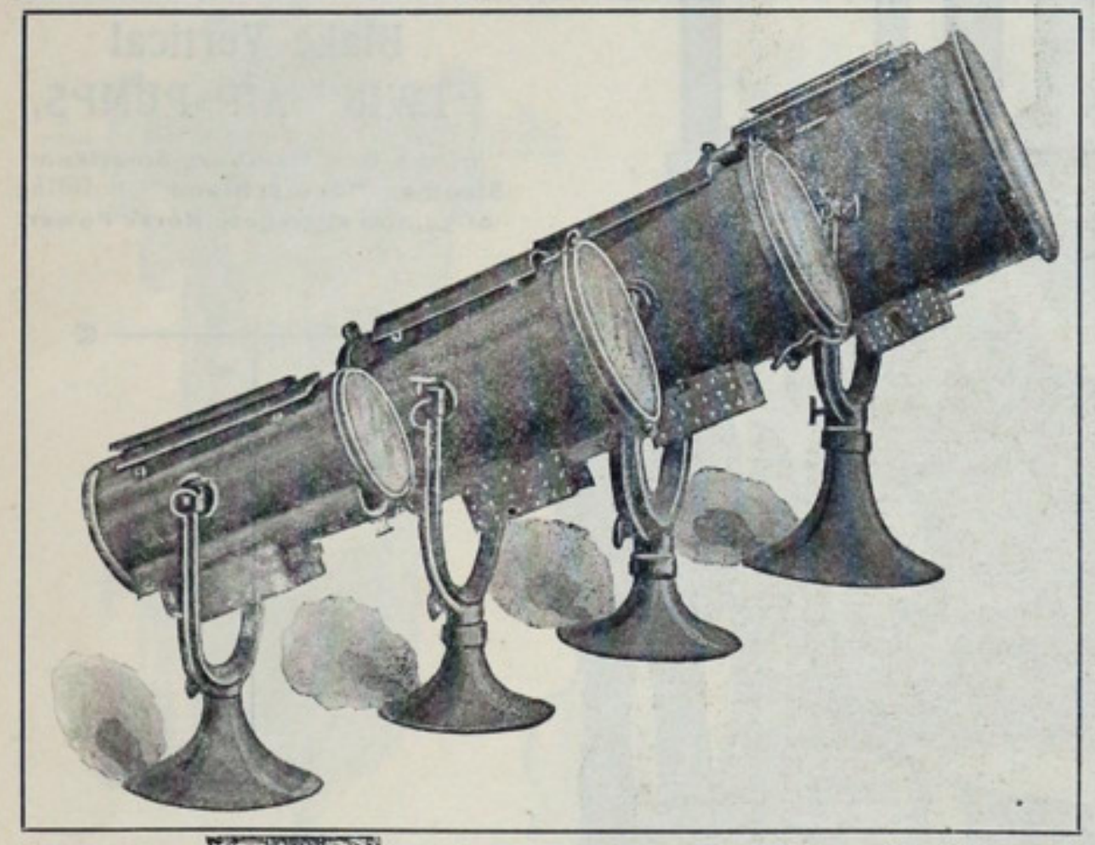

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The Engineer has Nothing to Do with it.
The Captain Only Has to Look at it.

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